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Launch Test Directive

PROGRAM 162

CONTRACT AF 04(695)-233

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PROGRAM 162

LAUNCH TEST DIRECTIVE

CONTRACT AF 04 (695) - 233

1694

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This document supersedes Discoverer Flight Test Directive LMSC 445925-C. That document and its associated appendices and tabs should be destroyed in accordance with applicable USAF instructions.

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CONTENTS

SECTION I INTRODUCTION

PAGE

1.1 Contractual Requirement 1-1
1.2 Purpose 1-1
1.3 Arrangement 1-1
1.4 Changes 1-1
1.5 Relationship to Detailed Test Objectives 1-1
1.6 Other Information Sources 1-1

SECTION II TEST OBJECTIVES

2.1 Flight Mission 2-1
2.2 Definitions 2-1
2.3 Primary Test Objectives 2-1
2.4 Secondary Test Objectives 2-1
2.5 Vehicle Performance 2-1

SECTION III ORGANIZATION

3.1 General Information 3-1
3.2 Launch Control Activities 3-1
3.3 Launch Personnel 3-3

SECTION IV CONFIGURATION

4.1 General Configuration 4-1
4.2 Detailed Vehicle Configuration 4-4
4.3 Detailed Launch Complex Configuration 4-7
4.4 Missile Assembly Building (MAB) 4-11
4.5 Detailed Ground Space Communication System Configuration 4-11

SECTION V VEHICLE LAUNCH PREPARATIONS

5.1 General Information 5-1
5.2 Launch Complex Preparations 5-1
5.3 Test Procedures 5-1
5.4 Satellite Vehicle Work Schedules 5-2
5.5 Satellite Vehicle MAB Checkout 5-2
5.6 Satellite Vehicle Pad Checkout 5-3
5.7 Booster Pad Checkout 5-4
5.8 AFSSD Evaluation 5-4
5.9 R Minus Days Activity 5-4

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6595TH TW 63-0717

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CONTENTS (Cont'd)

PAGE

SECTION VI COUNTDOWN AND LAUNCH SEQUENCE

6.1 Launch Operations Control Procedures 6-1
6.2 Countdown 6-1
6.3 Launch Sequence 6-1

SECTION VII LAUNCH CRITERIA

7.1 Definition 7-1
7.2 Source of Launch Criteria Information 7-1
7.3 Launch Decision 7-1
7.4 Vehicle Readiness 7-1
7.5 Pad Conditions 7-1
7.6 Photographic Coverage 7-2
7.7 Weather Forecasts and Reports 7-2
7.8 Weather Conditions 7-2
7.9 Radio Frequency Interference 7-5
7.10 Range Clearance 7-5
7.11 Vehicle Telemetry Readiness 7-5
7.12 Tracking Systems Readiness 7-6
7.13 BTL Guidance Readiness 7-6
7.14 Hold Time Limitations 7-7

SECTION VIII LAUNCH INSTRUMENTATION AND LAUNCH DATA

8.1 General 8-1
8.2 Launch Instrumentation 8-1
8.3 Launch Data Acquisition 8-8
8.4 Launch Data Processing 8-14
8.5 Launch Data Distribution 8-14

SECTION IX LAUNCH REPORTS

9.1 General Information 9-1
9.2 Launch Progress Information 9-1
9.3 Flash Launch Report 9-1
9.4 Final Launch Report 9-1
9.5 DAC/VAFB Launch Reports 9-1

FIGURES

Number	Title	Page
4-1	SLV-2A Booster	4-2
4-2	S-01A Vehicle	4-3
6-1	Integrated Milestone Countdown Chart	6-2
8-1	Pad Camera Stations	8-5

TABLES

7-1	Weather Forecast Requirements	7-3
7-2	Wind Shear Analysis, Procedure	7-4
8-1	Engineering Sequential Photographic Requirements	8-3
8-2	Documentary Photographic Requirements	8-4
8-3	Metric Optic Data Requirements	8-6
8-4	PMR Photographic Film Requirements	8-7
8-5	Launch Weather Data Requirements	8-10
8-6	FPS-16 Radar Launch Data Coverage	8-12
8-7	Range Safety Data Coverage	8-13
8-8	Flight Test Launch Data	8-16

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SECTION I

INTRODUCTION

1.1 CONTRACTUAL REQUIREMENT

Lockheed Missiles and Space Company (LMSC) has been assigned responsibility for technical direction of the Program 162, and for the publication of a Launch Test Directive (LTD) to cover each launch in accordance with the provisions of Air Force Contract 04 (695) -233. The LTD is distributed in accordance with directions issued by the 6595th Aerospace Test Wing.

1.2 PURPOSE

The purpose of the LTD is to provide a working document to define objectives, to set forth evaluation criteria and to delineate preparation and support requirements for the pre-launch and launch portion of the flight test. The LTD also provides vehicle and system information to enable more effective participation by support agencies and by the range in a countdown and launch.

1.3 ARRANGEMENT

The basic LTD document will remain substantially the same for all Program 162 launches. Data relating to individual flights will be issued under appropriate tabs as appendices to the LTD.

1.4 CHANGES

Changes are furnished to activities covered in the distribution list as they are published. Changes will be serially numbered and the change number and date of change printed on the change record sheet and on each new page issued for purposes of identification.

1.5 RELATIONSHIP TO SYSTEMS TEST OBJECTIVES (STO)

The LTD utilized the Systems Test Objectives, LMSC 448510-A, issued by LMSC, Sunnyvale as a source document for information and is in agreement with the objectives and general test specifications contained therein.

1.6 OTHER INFORMATION SOURCES

The 6595th Aerospace Test Wing, LMSC, Douglas Aircraft Company, Rocketdyne, Bell Telephone Laboratories, and other agencies provide information for inclusion in this document.

TEST OBJECTIVES

2.1 FLIGHT MISSION

The mission of all Program 162 flights covered by this document is to place satellites carrying designated test payloads on prescribed polar earth orbits and to recover a data capsule ejected from the orbiting satellite.

Program 162 will incorporate basic flight mission profiles as determined by the configuration and objectives of payload selected for evaluation.

2.2 DEFINITIONS

2.2.1 Primary Test Objectives Defined

A primary objective is one for which a test flight is undertaken and must not, therefore, be compromised by any discernible inadequacy of airborne or ground equipment, procedures or personnel. Status changes that jeopardize the accomplishment of a primary objective are sufficient justification to hold, recycle, or terminate the countdown.

2.2.2 Secondary Test Objectives Defined

A secondary objective is one which is of vital concern to the research and development of satellite systems and space technology, but not prerequisite to the attainment of a primary objective. If the accomplishment of any secondary objective appears to be in jeopardy at any time prior to initiation of the booster automatic launch sequence, the countdown may be held or recycled to resolve the difficulty.

2.3 PRIMARY TEST OBJECTIVES

The primary objectives of each flight are:

To place a 162 Satellite, carrying a test payload and with a specified active orbital life capability, on a prescribed near-polar orbit.

To secure adequate telemetered data from the 162 Satellite during its active orbital life for determination of objectives achievement.

To recover a nose-cone capsule, ejected from the satellite by command, after one, two, three, or more lays of active orbital life.

2.4 SECONDARY TEST OBJECTIVES

Secondary test objectives are called out in the S.T.O.

2.5 VEHICLE PERFORMANCE

Vehicle performance necessary to achieve the objectives is set forth in the S.T.O.

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SECTION III

ORGANIZATION

3.1 GENERAL INFORMATION

This section contains information relative to the certain activities, organizations, publications, and personnel connected with launch preparations and launch of the vehicle.

3.2 LAUNCH CONTROL ACTIVITIES

3.2.1 Headquarters, Air Force Space Systems Division, (AFSSD), Inglewood, California

Over-all control of the program is exercised by Headquarters, AFSSD, Inglewood, California through the System 162 Directorate.

3.2.2 6594th Aerospace Test Wing

The 6594th Aerospace Test Wing located at Sunnyvale is responsible for controlling and coordinating the tracking and vehicle operations during the orbital phase with assistance from the contractors. As System Test Controller, the 6594th ATW performs the following:

Operates the Satellite Control Facilities.
Approves the Orbital Test Directive.
Establishes local operating procedures.
Supports launch base with tracking and telemetry services for checkout, prelaunch countdown operations, the operational readiness of the tracking stations and supporting forces.
Transmits to the launch base a clearance to launch or a directive to hold.

3.2.3 6595th Aerospace Test Wing

The 6595th Aerospace Test Wing located at VAFB is responsible for prelaunch and launch phases of the system test operations with assistance from the contractors.

The 6595th ATW performs the following:

Negociates with PMR for range support.
Conducts launch countdown and launch phase of test.
Operates Launch Operations Control Center (LOCC).
Establishes local standard operating procedures.
Participates in preparation of system standard operating procedures.
Evaluates launch operations and recommends improvements.
Prepares and submits reports as required.

[redacted]

SECTION III

ORGANIZATION (Cont'd)

3.2.4 1st Strategic Aerospace Division, SAC

The Strategic Aerospace Division, with headquarters at VAFB, furnishes logistic support including weather forecasts and aircraft support.

3.2.5 Satellite Test Annex (STA)

The STA, located at Sunnyvale, monitors launch operations, coordinates other system functions with the launch activities, and controls the orbital phase activities of all tracking stations. It is manned by 6594th Aerospace Test Wing and LMSC personnel. Test direction and control of the STA is the responsibility of the Air Force Systems Test Controller, assisted by the LMSC Systems Test Director and technical staffs.

3.2.6 Pacific Missile Range (PMR)

The Pacific Missile Range is a Navy command with headquarters at Pt. Mugu. It provides downrange ship coverage, range safety, metric photography and frequency interference control for launches.

3.2.7 Orbit Test Working Group (OTWG)

The OTWG is composed of members from the 6594th Aerospace Test Wing, LMSC and associate contractors. The 6594th ATW furnishes the group chairman. The group is primarily concerned with Satellite Control Facility operation and those auxiliary facilities required for orbital test. It is responsible for review of system launch and orbit operations, coordination, effects of configuration changes, the resolving of problem areas through specific task assignments and for post flight operations evaluation. The group meets at Sunnyvale.

3.2.8 Launch Test Working Group (LTWG)

Headquarters AFSSD has assigned authority for launch preparation and countdown planning to the Launch Test Working Group (LTWG), which meets at VAFB. An officer attached to the 6595th Aerospace Test Wing serves as chairman of the group. The 6596th Instrumentation Squadron, Complex Safety Office, Range Support Office, PMR, LMSC/VAFB, DAC/VAFB, WCMR ITT Kellogg, Rocketdyne, BTL, furnish members to the LTWG. The LTWG is the approval authority for the Launch Test Directive, and the Countdown Manual.

3.2.9 Launch Operations Control Center (LOCC)

The LOCC is an Air Force Activity that exercises control and direction of countdown activities at VAFB. LMSC/VAFB assists the Air Force in LOCC operation.

SECTION III

ORGANIZATION (Cont'd)

3.3 LAUNCH PERSONNEL

3.3.1 General Information

Titles and broad statement of responsibilities of launch personnel are set forth in this sub-section.

3.3.2 Systems Test Controller, 6594th Aerospace Test Wing

The Commander 6594th Aerospace Test Wing or his delegated representative is the Systems Test Controller. The Systems Test Controller is stationed in the STA for launch. He coordinates the pre-launch preparations of the satellite control facility. He assumes operational responsibility of the vehicle at lift-off from the Launch Controller and exercises control during flight operations.

3.3.3 Systems Test Director

LMSC representative stationed in the STA for launch. He continuously monitors the countdown, launch and orbit operations and provides technical support to the System Test Controller.

3.3.4 Launch Operations Coordinator, 6595th Aerospace Test Wing

The Launch Operations Coordinator is an officer designated by the 6595th ATW stationed in the LOCC for launch. He exercises over-all direction of the launch area activities. This includes liaison with VAFB and PMR for launch support.

3.3.5 Launch Operations Director, LMSC, VAFB

The LMSC Launch Operations Director is the senior LMSC representative stationed in the LOCC for launch. He renders technical support to the Launch Operations Coordinator during countdown and launch at VAFB.

3.3.6 Launch Controller, 6595th Aerospace Test Wing

The Launch Controller is the 6595th Aerospace Test Wing Test Operations representative stationed in the Control Center. He directs pre-launch vehicle checkout and countdown and coordinates this activity with other elements of the system.

3.3.7 LMSC Launch Conductor

The LMSC Launch Conductor, stationed in the Control Center, directs Lockheed countdown activities according to the Countdown Manual. The LMSC Launch Conductor conducts main steps in the satellite vehicle countdown procedure, verifies their completion, requests necessary holds, and reports progress to the Launch Controller.

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SECTION III

ORGANIZATION (Cont'd)

3.3.8 Douglas (DAC) Launch Conductor

The DAC Launch Conductor, stationed in the Control Center directs the DAC countdown activities according to the Countdown Manual. The DAC Launch Conductor conducts main steps in the booster countdown procedure, verifies their completion, requests necessary holds, and reports progress to the Launch Controller.

3.3.9 Bell Telephone Laboratories Test Conductor-BTL

The BTL Test Conductor directs BTL Guidance Equipment countdown activities according to the Countdown Manual. The BTL Test Conductor directs all guidance equipment (ground guidance and missile-borne guidance) readiness tests, verifies their completion, calls necessary holds, and gives final guidance system readiness for launch to the DAC Launch Conductor.

3.3.10 Launch Complex Safety Officer

Complex safety for the 75-X Complexes is under the control of the 6595th Aerospace Test Wing. The 6595th ATW complex safety control is exercised through the Launch Complex Safety Officer, supported by the 1st STRATAD. Complex safety information is provided in the "Pad Safety Report" published by LMSC. These documents include information and safety precautions relating to clearance distance, criteria, procedures, propellants, ordnance items and pressures for both booster and satellite. Launch recovery and abort procedures are briefly covered in the Countdown Manual and are more thoroughly set forth in separate DAC and LMSC publications for booster and satellite, respectively.

3.3.11 Missile Flight Safety Officer (MFSO)

Flight safety for the 75-X Complexes is under the control of the PMR Missile Flight Safety Officer (MFSO). The MFSO monitors the launch from the Range Operations Center, requests countdown holds for range clearance, and commands destruct of errant missiles.

Range safety information will be provided in the PMR Range Safety Plan and in an LMSC document entitled "Range Safety Report", issued by LMSC, Sunnyvale 35 days prior to launch. Late revisions are transmitted in a "Range Safety TWX" by LMSC, Sunnyvale. The report covers the nominal predicted flight, dispersion patterns and the assumed types of malfunctions that might occur during ascent phase to booster burnout. Additional DAC range information is contained in Douglas report SM-37963, DM-21 Range Safety System issued in November 1960.

SECTION III

ORGANIZATION (Cont'd)

3.3.12 Other Launch Personnel

The designations and tasks of other Air Force, LMSC, DAC, BTL and VTS personnel participating in launch preparations and launch at the launch complex are set forth in the Countdown Manual.

SECTION IV

CONFIGURATION

4.1 GENERAL CONFIGURATION

Systems configuration for Program 162 is set forth in the Systems Test Objectives, LMSC 448510-A. It is briefly covered in this section.

4.1.1 Vehicle Configuration

Vehicles for the 162 Program consist of DAC SLV-2 or SLV-2A boosters mated to LMSC S-01 or S-01A satellite vehicles equipped with recoverable payloads. The tabs indicate the serial numbers of the booster-satellite vehicle combination. Figures 4-1 and 4-2 show booster and satellite vehicle.

4.1.2 Launch Operations Complex

The VAFB complex has the following major launch preparation and launch facilities:

DAC Receipt, Inspection and Maintenance (RIM) Building for receipt, storage and pre-launch-pad checkout of the booster.

The Missile Assembly Building (MAB) for receipt, storage and pre-launch-pad checkout of the satellite vehicle.

The SS/L Laboratory Building for payload receipt, storage and pre-launch-pad tests.

Launch Complex 75-1 with Pads 1 and 2 and Launch Complex 75-3 with Pads 4 and 5. Each complex has a control center and AGE for remote control of vehicle servicing, checkout and launch.

4.1.3 Ground-Space Communications System

The ground-space communication tracking and data system serving the launch phase is composed of the following major facilities:

Vandenberg Tracking Station

BTL Ground Guidance Station

PMR Optical and Radar Tracking System

PMR Missile Flight Safety System

Downrange Telemetry Ship

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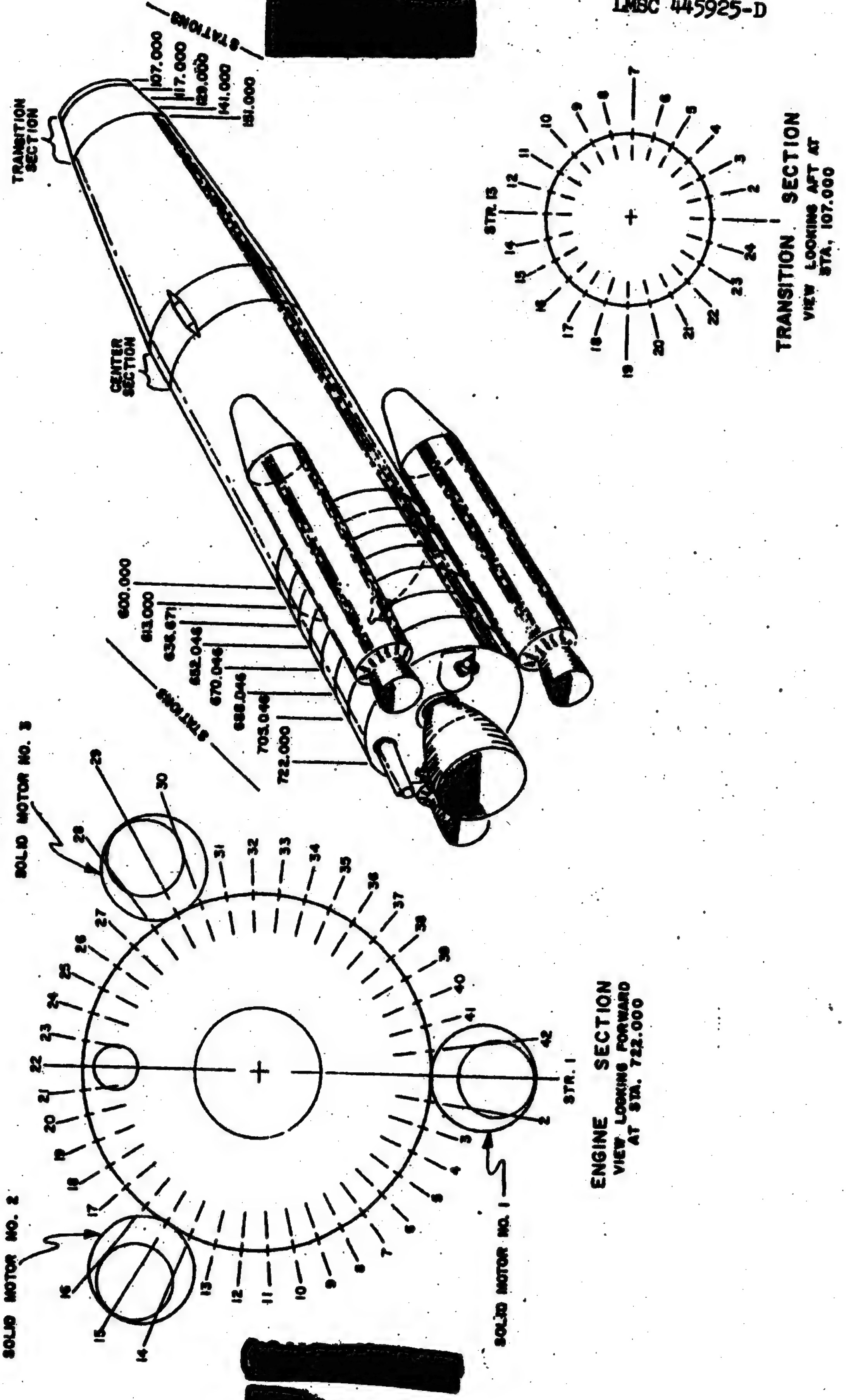

FIGURE 4-1

SLV-2A - BOOSTER

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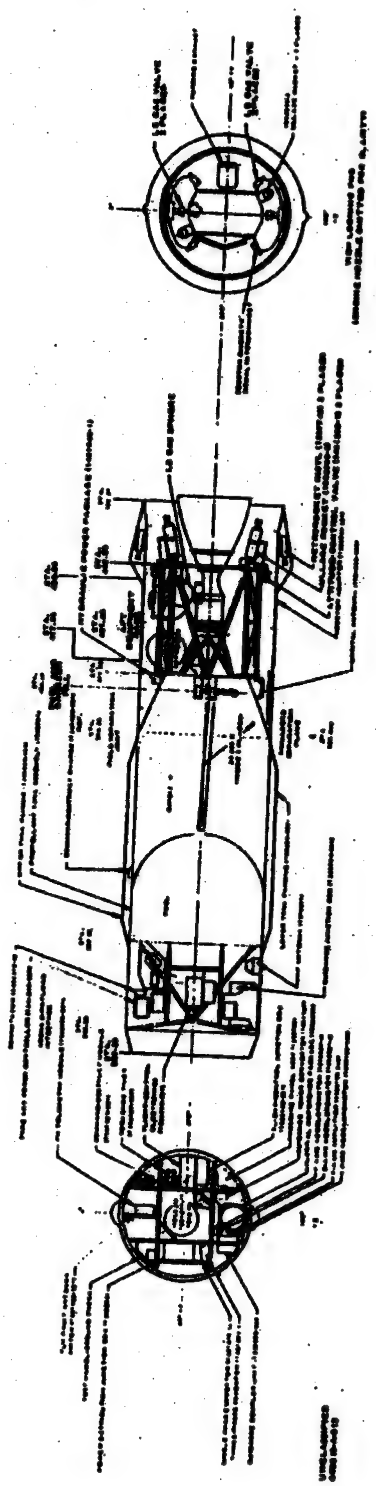

Figure 2-4 622A Agena D Model 30-205 Inboard Profile

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Figure 4-2

S-01A VEHICLE

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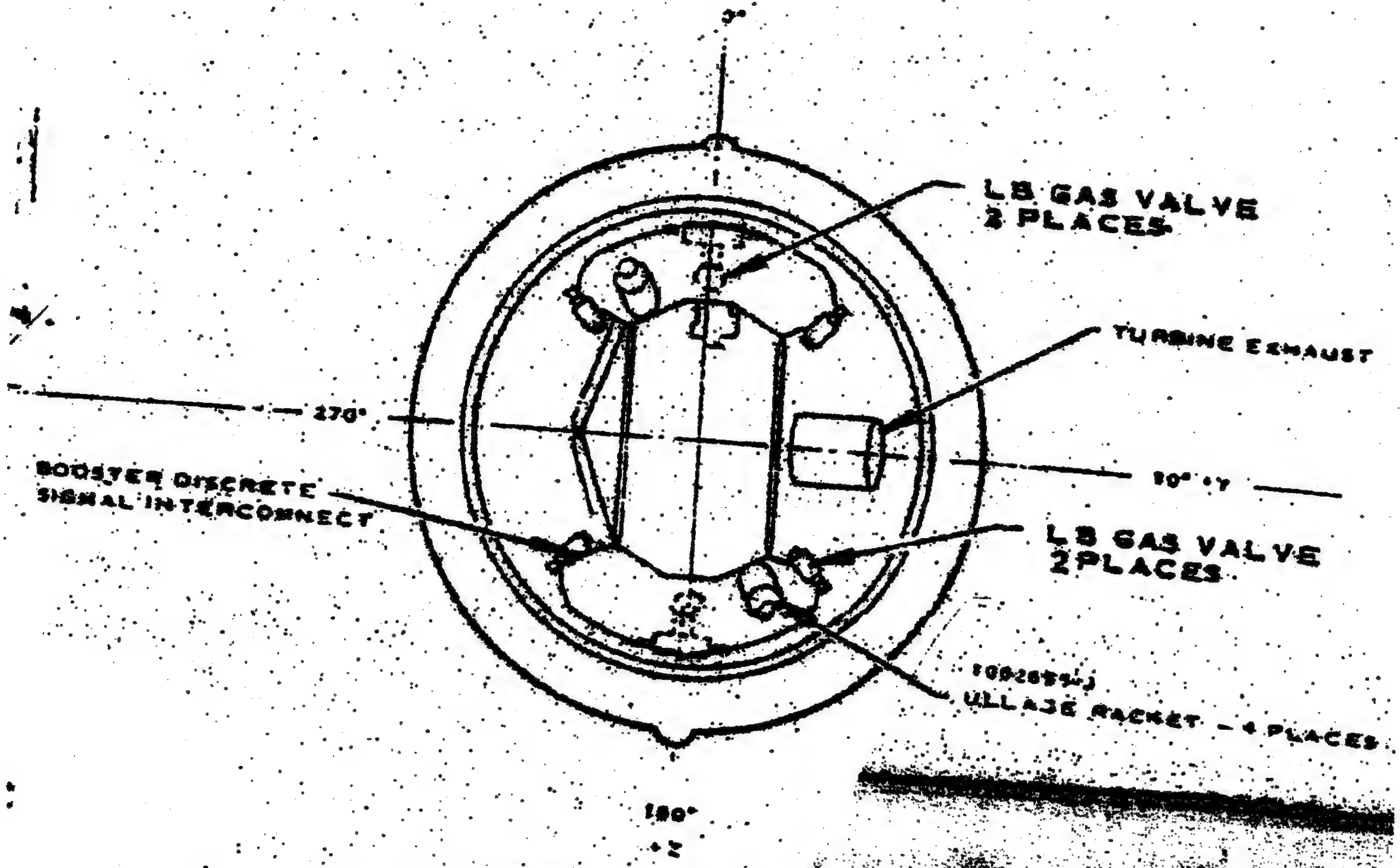

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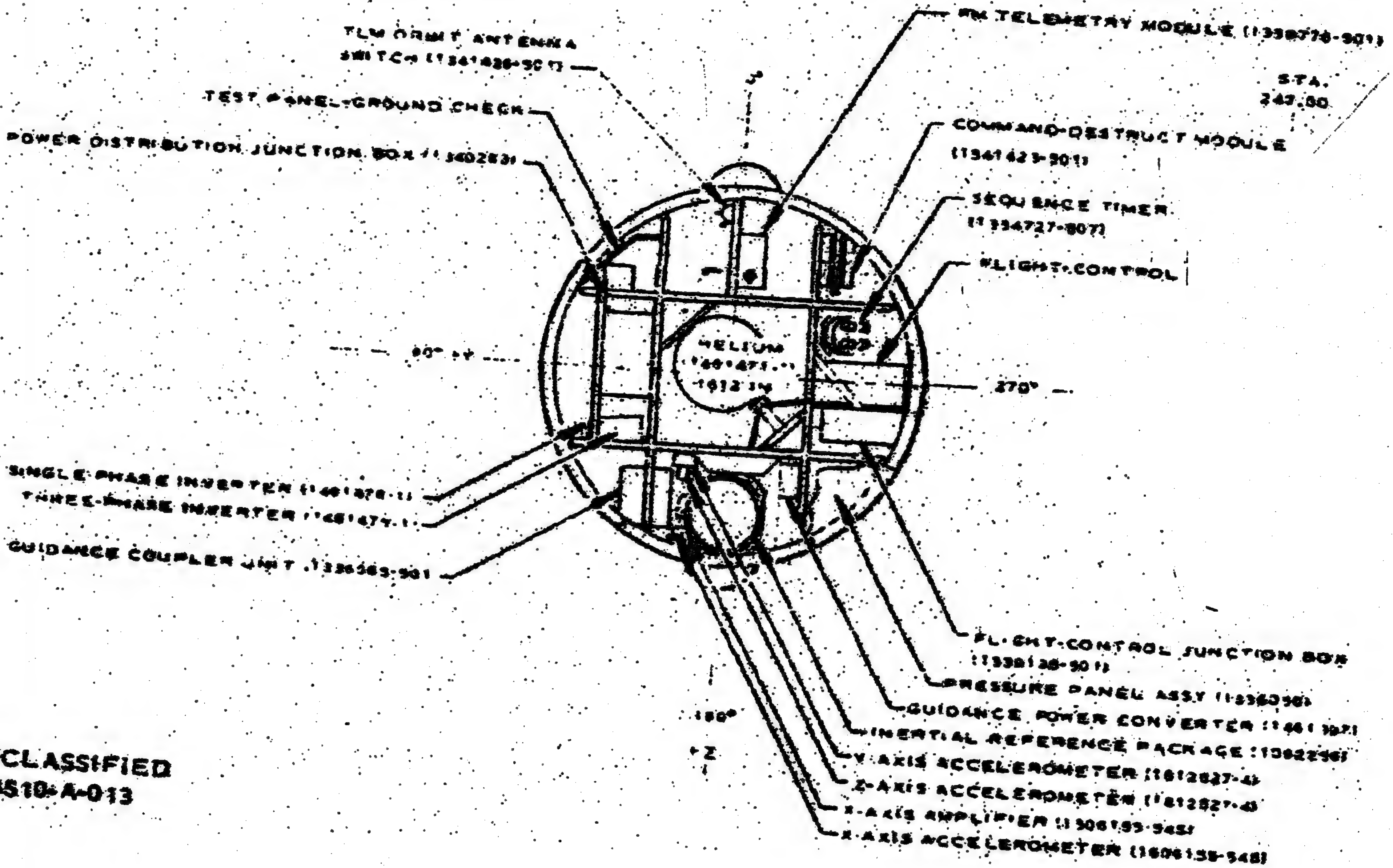
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STA. 242.00
COMMAND-DESTRUCT MODULE (1341423-901)
SEQUENCE TIMER (1334727-807)
FLIGHT-CONTROL
TLM OMNI ANTENNA SWITCH (1341426-501)
TEST PANEL-GROUND CHECK
POWER DISTRIBUTION JUNCTION BOX (1340253)
HELIUM (1461471-1) 1612 IN
90° +Y
270°
180°
+Z
SINGLE PHASE INVERTER (1461476-1)
THREE-PHASE INVERTER (1461477-1)
GUIDANCE COUPLER UNIT (1336363-901
FLIGHT-CONTROL JUNCTION BOX (1338128-901)
PRESSURE PANEL ASSY (1336036)
GUIDANCE POWER CONVERTER (1461927)
INERTIAL REFERENCE PACKAGE (1362256)
Y AXIS ACCELEROMETER (1612827-4)
Z-AXIS ACCELEROMETER (1612827-4)
X-AXIS AMPLIFIER (1306193-545)
X AXIS ACCELEROMETER (1606135-548)

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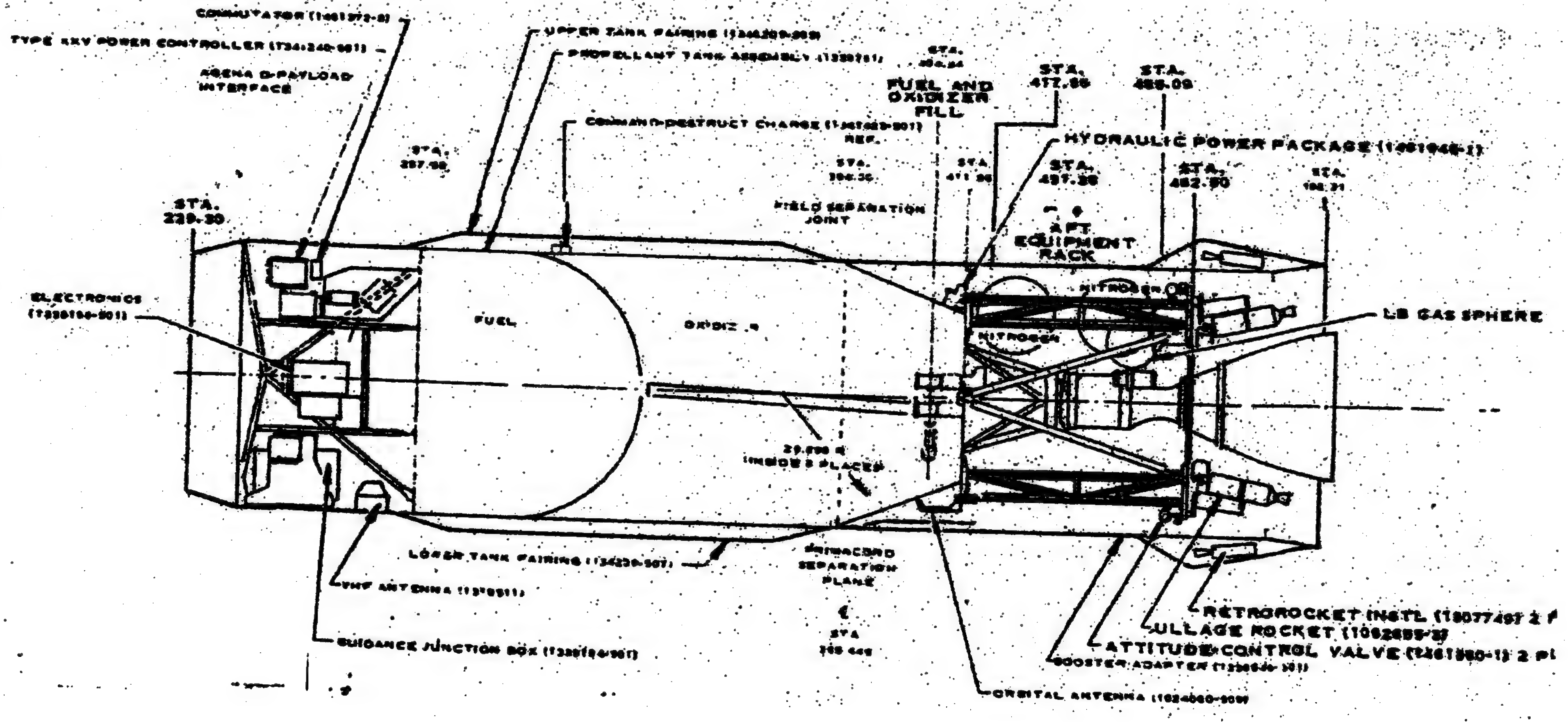

COMMUTATOR (1461372-3)
TYPE XXV POWER CONTROLLER (734240-501)
AGENA D-PAYLOAD INTERFACE
UPPER TANK FAIRING (1344209-509)
PROPELLANT TANK ASSEMBLY (1339751)
COMMAND-DESTRUCT CHARGE (1367829-501) REF.
STA. 229.30
STA. 257.90
STA. 396.30
STA. 404.44
FUEL AND OXIDIZER FILL
STA. 411.96
STA. 417.86
STA. 455.09
HYDRAULIC POWER PACKAGE (1461946-1)
STA. 437.26
STA. 462.90
STA. 496.71
AFT EQUIPMENT RACK
NITROGEN
LB GAS SPHERE
ELECTRONICS
FUEL
OXIDIZER
FIELD SEPARATION JOINT
INSIDE 3 PLACES
LOWER TANK FAIRING (1342329-507)
VHF ANTENNA
GUIDANCE JUNCTION BOX
PRIMACORD SEPARATION PLANE
STA 395.446
RETROROCKET INSTL (1307749) 2 P
ULLAGE ROCKET (1062655-2)
ATTITUDE-CONTROL VALVE (1461380-1) 2 PL
BOOSTER ADAPTER
ORBITAL ANTENNA (1024060-509)

4.1.4 Ground Communication System

The ground communication system consists of teletype, voice conference line and direct (hot) line systems, plus high frequency radio and microwave systems for off-base communications. Operational intercom, administrative dial and public announcing systems are provided for local communications.

4.2 DETAILED VEHICLE CONFIGURATION

The following subparagraphs contain a brief description of booster and satellite vehicle components.

4.2.1 Booster Configuration

The design of the booster has been adapted from the DM-21 (PG-2A) space vehicle. Design criteria of the SLV-2A booster are outlined in "Production and Acceptance Specification DS-2340" dated 31 August 1962. The top drawing number is 1A36317.

4.2.1.1 Airframe

The general arrangement of the SLV-2A booster is a central airframe with three solid-propellant rocket motors attached externally to the aft end. The airframe consists of a cylindrical two-tank structure with a base diameter of 8 feet; and a forward conical section, the diameter of which tapers from 8 to 5.33 feet. The lox tank vent includes an elbow assembly to direct gas diffusion after MECO, and to prevent chilling of the solid motors when the tank is vented in the terminal countdown. The engine section of the SLV-2A booster has thicker skin than SLV-2 which will be used for designated Program 162 vehicles. The ejection tracks for the solid motors have been added. Additional thrust ribs strengthen the skirt between the lox tank and the engine section. Cork insulation has been added to the surface of the base of the engine section and to the ejection tracks.

4.2.1.2 Propulsion System

The propulsion system consists of a gimballed Rocketdyne YLR -79-13 baffled main engine, two Rocketdyne LR-101-11 liquid-propellant vernier engines, and three solid propellant Thiokol TX33-52 rocket motors. The liquid propellant system is designated MB-3, Block III. The main engine is rated at 170,000 pounds thrust (± 3 per cent) at sea level; each vernier engine at 1,040 pounds of thrust (± 3 per cent) at sea level; and each solid propellant motor at 52,600 pounds of thrust (± 10 per cent) at sea level. The propulsion system also includes two main propellant tanks, a gas generator, a turbopump, propellant lines and associated plumbing. Propellants for the main and vernier engines are liquid oxygen (lox) and RJ-1 fuel (a kerosene-like hydrocarbon). The solid propellant for the TX33-52 motors is polybutadiene acrylic acid co-polymer (PBAA) as the fuel,

[redacted]

[redacted]

4.2.1.2 Propulsion Sy[redacted]

and ammonium perchlorate with 14 per cent aluminum as the oxidizer. The main engine gimbals to provide pitch and yaw attitude control; the vernier engines provide roll stabilization. The solid motors do not gimbal.

4.2.1.3 Solid Motors

Each solid motor of the SLV-2A booster is 31 inches in diameter and 237 inches in length. The total weight of each solid moter is approximately 8,796 pounds, of which 7,313 pounds are propellant. The case is of 4130 steel with internal insulation. The forward dome is hemispherical, with an opening for the pyrogen igniter. The igniter is actuated by signal from the fuel injecter pressure switches on the main engine. When fuel injector pressure reaches the required level, a relay actuates igniters in the pyrogen unit, and flame is expelled into the bore of the solid moter, igniting the tips of the webbing. With propellant at 60 degrees Fahrenheit, the nominal burning duration is 27.8 seconds through the web. The total burning duration is 41.1 seconds at that temperature. At 60 deg F, initial thrust is predicted as 52,600 pounds; average thrust throughout the burning is 39,600 pounds.

4.2.1.4 Solid Motor Nose Cone

Each solid motor is fitted with an aluminum nose cone, which tapers from 31 inches to 0 over a length of 61 inches.

4.2.1.5 Solid Motor Suspension and Release

A thrust ball extends from the upper end of the solid motor case to transmit thrust to the vehicle. The ball fits into a socket on the booster at the transition between the lox tank and the engine section. Flanges on the ball and socket are clamped together in a retaining ring, which is tightened with an explosive bolt. Sway braces next to the ball restrict lateral movement of the solid motor. An ejection link between the solid motor and the booster base will direct the motor away from the booster when it is ejected. The bottom of the solid motor includes an ejection beam, which fits with an ejection rail at the bottom of the engine section. The rail is angled to slide the solid motor away from the booster after ejection.

4.2.1.6 Control System

The booster autopilot system is designed to stabilize and control the booster during powered flight. The major components of the system are the flight controller, the rate gyros, the hydraulic actuators, and the electrical power equipment.

4.2.1.7 Guidance System

BTL Series 400 Missile Borne Guidance Equipment decodes the steering and discrete commands transmitted by BTL Ground Guidance Station and routes them to the booster or satellite vehicle as required.

4.2.1.7 Electrical Equipment

In addition to the flight contro [redacted] RT-45 rate gyros, electrical equipment includes: A Bendix in c, three phase, 400 cps, 1.5 kilovolt-amperes), one Yardney 2 lt battery for booster control power, one instrumentation battery for each t, and associated wiring. The

4.2.1.7 Electrical Equipment (Cont'd)

inverter supplies ac power to the flight controller. The missile control battery is the primary power for the engine relay box circuits, the flight controller, the rate gyros, and the inverter.

4.2.1.8 Hydro-Mechanical Equipment

Hydro-mechanical equipment provides the motive power for gimbaling the engines in response to commands from the flight controller. During pre-flight checkout and launch, a ground system brings hydraulic pressures up to in-flight levels, and allows checkout of the control system. In flight, hydraulic pressures are maintained by a pump powered by the gas generator.

4.2.1.9 In Flight Hydraulics

The hydraulic pump and the hydraulic accessory unit, which includes a reservoir and accumulator system, maintain the in-flight hydraulic supply at a pressure of 3,000 psia for the demands of the engine actuators. Control equipment includes two main hydraulic actuator assemblies, two vernier pitch/roll actuator assemblies and two vernier yaw actuator assemblies. The major components of the actuators are the servo valve, the cylinder assembly, and the position feedback potentiometer.

4.2.2 Satellite Vehicle Configuration

The satellite vehicle consists of a basic S-01 or S-01A vehicle into which a Program 162 payload and special Geophysics Research Directorate (GRD) equipments are installed. The satellite vehicle is composed of the following subsystems: Subsystem A the spaceframe, Subsystem B the propulsion system, Subsystem C the electrical power system, Subsystem D the guidance and control systems and Subsystem H the airborne ground/space communications system. The payload is carried in the forward end of the satellite vehicle and covered by the nose cone. These components are briefly described in the following subparagraphs. A more thorough description of the S-01A vehicle is set forth in the Vehicle Familiarization Manual, LMSC A075695. The applicable equipment list sets forth vehicle components.

4.2.2.1 Subsystem A - Spaceframe

The satellite spaceframe, Subsystem A, consists of a nose section which houses the payload and is jetisoned for orbit, a forward body containing equipment racks, midbody consisting of propellant tanks and aft body with more equipment racks and the booster adapter which covers aft vehicle components and attaches to the booster. The spaceframe provides the aerodynamic shape for the satellite.

4.2.2.2 Subsystem B - Propulsion

The propulsion system consists of a Bell Aircraft liquid rocket engine, propellant feed and pressurization systems. It develops about 16,000 lbs thrust. The propulsion system uses UDMH for fuel and IRFNA for oxidizer.

[redacted]

4.2.2.3 Subsystem C - Internal Electrical Power

This subsystem supplies electrical power needed to operate satellite equipment. It consists of primary batteries; a three phase, 400 cycle, 115 volt inverter; a single phase, 400 cycle, 115 volt inverter; regulators, circuitry and associated equipment.

4.2.2.4 Subsystem D - Guidance and Control

Subsystem D directs the flight along a prescribed path in a controlled attitude according to a timed program by means of engine gimbaling and guidance gas jets. SS/D consists of a computer, an internal reference package, horizon sensors, flight control electronics package, pneumatic control system, hydraulic control system and secondary junction box.

4.2.2.5 Subsystem H - Ground Space Communications

This subsystem consists of RF receivers, transmitters and associated components. It transmits satellite status telemetry to the ground station and receives command signals from ground stations and sends verifications in response to accepted signals.

4.2.2.6 Subsystem J - Geophysics Research Directorate Equipment

This subsystem consists of instrumentation for conducting experiments and obtaining telemetered outer space data of interest to the Directorate.

4.3 DETAILED LAUNCH COMPLEX CONFIGURATION

The two launch complexes used for Program 162, 75-1 and 75-3, each have a Control Center Building connected to the launch pads by long run cables. Each of the four pads, 1 and 2 for Complex 75-1 and 4 and 5 for 75-3, is equipped with mechanical and electrical support equipment for vehicle servicing and checkout.

4.3.1 DAC Support Equipment

The configuration of DAC tactical support equipment has been modified to accommodate satellite vehicle launches. The equipment retains the capability of automatic checkout and launch preparation which are part of tactical system design. The components are briefly described in the following paragraphs.

4.3.1.1 Erecting - Launching Mount

The erecting-launching mount provides both the means of erecting the vehicle and the base from which it can be fired. The mount itself is supplemented by a hydraulic pumping unit and an erector-transporter boom. The mount is an adjustable, steel, support structure which is bolted to a prepared steel and concrete sub-structure. It serves as a pedestal for the vehicle and as a support for the service cables and ducts to the vehicle.

4.3.1.1 Erecting - Launching Mount (Cont'd)

When joined to the erecting-launching mount, the erector-transporter is used to raise the vehicle to the vertical position; detached, it serves as a vehicle for transporting the booster. The erector-transporter is disconnected after the booster has been raised in preparation for the countdown.

4.3.1.2 Solid Motor Transporter-Erector

The solid motor transporter/erector is a four-wheel mobile trailer which serves as an erector to raise the solid motor into vertical position. It also provides for access to work areas on the solid motors.

4.3.1.3 Missile Hydraulic Ground System

Ground hydraulic pressures are provided from the ground supply hydraulic console in the hydro-pneumatic trailer (HPT). Hydraulic lines lead into the engine section of the booster and to the hydraulic accessory unit, from which hydraulic pressure is rationed on demand for the control system checkout. At liftoff, quick-disconnect couplings release the ground supply, check and relief valves isolate the ground supply and return lines, and the booster control system begins to function on internal hydraulic power.

4.3.1.4 AGE Hydraulics

Launcher hydraulics actuate during three events in pre-flight and launch: early in pre-flight procedures, the erector actuator equipment powers the vehicle erection; in the task countdown, the erector actuator equipment lowers the transporter-erector; and at liftoff the umbilical mast flag actuator equipment operates to retract the flag.

4.3.1.5 Air Conditioning

During a countdown, air conditioning equipment maintains a continuous supply either of heated air (at 1,000 cubic feet per minute) or of a heated air/nitrogen mixture (at 200/400 cubic feet per minute) in the engine section of the booster. During Phases I and II of the terminal countdown, heated air is circulated to prepare for the cooling effects of lox loading. When propellant transfer starts, a heated air-nitrogen mixture is furnished to minimize the possibility of fire resulting from lox or fuel leakage and to maintain the temperature of the engine section above zero Fahrenheit.

4.3.1.6 Propellant Transfer System

The propellant transfer system stores liquid oxygen and RJ-1 fuel; on command, it loads the propellants and compressed nitrogen gas into the booster.

The lox transfer equipment includes: a storage tank, a valve complex, the main transfer line, and gaseous nitrogen storage and transfer equipment. Fuel transfer equipment includes: a storage tank, a valve complex, and the gaseous nitrogen storage and transfer equipment. Supplementary equipment includes: a filtering and de-watering uni[redacted] reciprocating compressor, a vacuum pump, and supporting ele[redacted]c equipment.

4.3.1.7 Water System

The water system provides fire protection for the launch emplacement. It is a "Fail Wet" system, which includes a deck flush, the launcher Firex, and the revetment Firex equipment. Each system can be controlled independently from the instrumentation and facilities (I&F or PC&M) console in the blockhouse. Water flow is controlled remotely by solenoid-operated valves.

4.3.1.8 Cooling Water (Flame Deflector)

The water system at the 75-1 complex includes cooling water for the flame deflector. The system is activated manually during phase V of the countdown. The initial flow rate, 7,500 gpm, is reduced to 1,500 gpm when the launcher Firex comes on.

4.3.1.9 Service Tower

A service tower is installed at launch pad 1. The tower will not be used for Program 162 launches.

4.3.1.10 Electrical Trailers

The electrical equipment and missile checkout trailers contain power supplies for the launch operations, circuits for checking and monitoring various booster equipment, and circuits for controlling the countdown sequence and indicating malfunctions. Trailer-mounted, diesel-engine generator sets provide 480-volt power through a power switchboard. The power is distributed to the control area utility receptacles, and to the skid-mounted power switchboards. The switchboards distribute all power to various loads in the trailers, the vehicle and the blockhouse.

4.3.1.11 Control Center Electrical Equipment

Consoles in the Control Center for Douglas equipment include: instrumentation and facilities (I&F or PC&M), which monitors propellant transfer, fire protection, and other similar launch activities; flowmeter, which monitors fuel loading; systems monitor, which indicates malfunctions, controls the launch, and provides for manually over-riding events in the automatic sequence; the government-furnished operation and control (O&C) console, which provides for checkout of the range safety equipment, for supplying external power to the booster, for transferring from external to internal power as appropriate in the countdown, and for initiating the calibration sequence for sub-carrier oscillators; and spin motor monitor, which monitors the spin motors in the HIG and rate gyros.

4.3.2 LMSC Support Equipment

LMSC utilizes both permanently installed and movable support equipment at the launch complexes for satellite vehicle servicing and checkout. The components are briefly described in the following paragraphs.

4.3.2.1 Launch Control Consoles

The launch control system consoles are a group of consoles in the Control Center. They are used for remotely controlling checkout of vehicle subsystems. Fueling and pressurization of the satellite vehicle can be controlled from the LCS consoles. Vehicle responses to LCS stimuli, temperatures, voltage, pressure, etc., readings are visually displayed on the consoles and recorded on associated recorders. Long run cables connect the equipment to the launch pads. In addition to LMSC and DAC consoles, the 6595th ATW has consoles for the launch controller and the safety officer.

4.3.2.2 Pad Electrical Trailers

The pad electrical trailers contain power supplies for pad electrical equipment and interconnect boxes for cable termination and routing. The electrical umbilical, test plug cables, and long run cables are routed to the pad electrical trailer.

4.3.2.3 Gas Storage Equipment

The gas storage consists of helium storage tanks and guidance gas storage tanks for serving the satellite vehicle. Nitrogen for AGE usage is obtained from DAC sources.

4.3.2.4 Gas Transfer Equipment

The helium is piped to a cabinet where the tank pressure is reduced from about 6000 PSIG to about 4000 PSIG. It then flows to the pneumatic cabinet where the pressure and transfer to vehicle storage spheres and propellant transfer system are controlled.

Guidance gas passes from the trailer to the pneumatic cabinet where flow to the vehicle guidance gas storage tanks is regulated.

The N_2 gas supply for QD actuation and other AGE purposes is also regulated and distributed through the pneumatic cabinet.

4.3.2.5 RF Equipment

An RF console processes signals received through the mast coaxial cables leading to the satellite vehicle. The RF signals are routed to an antenna array for transmission to the MAB and VTS.

4.3.2.6 High Lift Crane

A high lift crane equipped with work platform is used to manually service the satellite vehicle when it is erected.

[redacted]

4.4 MISSILE ASSEMBLY BUILDING (MAB)

The MAB houses IMSC/VAFB offices and satellite vehicle checkout space. It contains the following checkout areas:

SS/A Area for vehicle and component checkout

SS/D Area and Laboratory for guidance system checkout

SS/H Telemetry Laboratory for bench checking telemetry components

Data and Analog Stations

Ground Station and Computer Laboratory

4.5 DETAILED GROUND SPACE COMMUNICATION SYSTEM CONFIGURATION

The following subparagraphs contain a brief description of the ground-space communication system.

4.5.1 Vandenberg Tracking Station (VTS)

The VTS, also referred to as the Vandenberg Station, is the principle element in the ground space communication link. It is located on Casmalia Hill about 7½ miles east of the 162 launch complexes.

The VTS performs the following functions:

Participates in pre-launch RF checkout

Commands the satellite vehicle

Tracks the vehicle

Receives, records, and processes telemetry

Transmits data to STA via microwave and TWX

The antenna systems and their related equipment perform the following launch and ascent functions:

The VERLORT antenna tracks the vehicle and interrogates the satellite beacon.

The TLM-18 antenna acquires telemetry sent by the satellite vehicle PAM/FM and FM/FM from liftoff to loss of signal.

4.5.1 Vandenberg Tracking Station (VTS) (Cont'd)

The T and D antenna is capable of Doppler tracking the vehicle.

The angle tracking antenna tracks the vehicle.

4.5.2 BTL Command Guidance System

The BTL command guidance system consists of a precise, ground-based guidance radar, a Remington-Rand-Univac (RRU) "Athena" Computer, and a Series 400 Missile Borne Guidance Equipment (MBGE) set. Booster position is determined by the guidance radar as the radar tracks the missile. This position information is fed into the RRU Computer. In the computer, the booster position, as determined by the radar, is continuously compared with the planned trajectory.

From the computer, the steering orders and discrete commands are fed to ground radar, where they provide intelligence to the signal sent to the MBGE.

After processing by the MBGE, the steering orders and discrete commands are fed to guidance control equipment in the missile. Response of the MBGE to orders and commands sent from the ground guidance radar are monitored by telemetry.

4.5.3 PMR Optical and Radar Tracking System

The PMR fixed and mobile tracking units (MOTU) provide optical photographic and tracking coverage through motion picture cameras and Askania cinetheodolites. Short range radar tracking is provided by M-33 and SPN radars near the launch site. Long range tracking is provided by FPS-16 and MPS-19 radars located at Pt. Arguello, Pt. Mugu, and San Nicolas Island.

4.5.4 PMR Missile Flight Safety System (MFSS)

The MFSS utilizes facilities at VAFB and PMR to provide information to the Missile Flight Safety Officer at the NMF Range Operations Building. That building is the focal point for system readouts and is where destruct command of errant missiles originates. Major equipment of the range safety system consists of the following:

Vertical wire sky screens and electronic sky screens (FPN-33)

SPN, M-33, MPS-19 and FPS-16 radars for skin tracking

COTAR in conjunction woth booster telemetry

Optical trackers

Command destruct transmitters

4.5.5 Telemetry Ship

The telemetry ship under the command of PMR is stationed at a prescribed distance down range to cover the boost phase of the vehicle, coast and engine burn of the satellite. The ship [redacted] for angle and range data. Quad-helix antenna is used for Do tracking data and telemetry data are transmitted to the STA radio. TLM is recorded on magnetic tape for carrier deli

SECTION V

VEHICLE LAUNCH PREPARATIONS

5.1 GENERAL INFORMATION

Applicable DAC and LMSC test procedures contain details of booster and satellite vehicle tests and checks performed in the RIM, in the MAB and at the launch pad. In preparation for the flight, subsystem, system, and validation tests are performed on the booster, satellite vehicle and associated AGE and support systems as established by the LTWG. The contractor demonstrates material readiness by these checks to a 6595th ATW representative. The 6595th ATW representative and appropriate senior launch engineers will review the results of these tests. The 6595th ATW then makes final determination of technical readiness of the systems for the flight. Validation checks will include flight control, destruct, DAC propellant flow, and the countdown and flight systems test.

5.2 LAUNCH COMPLEX PREPARATIONS

The pad is cleaned up and damaged material replaced after the preceding launch. Modifications to AGE are made, if necessary, to conform to different vehicle configurations. Electrical and mechanical checks are made to insure AGE readiness to receive booster and satellite vehicle.

5.3 TEST PROCEDURES

5.3.1 Booster Test Procedures

Test procedures for readying the booster for launch are prepared by DAC.

5.3.2 Satellite Vehicle Test Procedures

Procedures for satellite vehicle tests to be performed at VAFB are prepared by LMSC/VAFB in accordance with test requirements established by LMSC, Sunnyvale and the USAF. Test procedure numbers are furnished to LMSC, Sunnyvale for inclusion in the Vehicle Test Plan.

5.3.2.1 Satellite Vehicle Test Plan

Vehicle Test Plans are issued for each vehicle under LMSC, Sunnyvale drawing numbers. The plans reflect program requirements and specify the engineering tests required for each vehicle. The documents carry a brief reference to component tests, manufacturing procedures, and final assembly procedures. Systems tests at LMSC, Sunnyvale and tests at LMSC/VAFB are covered in more detail. The applicable procedures for VAFB tests are listed and a brief description of each test is given. There are about 40 test procedures covering VAFB MAB and pad vehicle checkout.

[redacted]

5.3.2.1 Satellite Vehicle Test Plan (Cont'd)

Drawing numbers assigned to Program 162 Vehicle Test Plans are as follows:

Vehicle Number	Test Plan Drawing Number
1159	1415209
1160	1353967
1161	1415576
1162	1415576
1163	1415576
1164	1415301
1165	1415301
1166	1415301

5.3.2.2 Test Procedure Indices

Central Planning and Control Group, LMSC/VAFB, issues an index of test procedures for each vehicle. Launch Systems Engineering Department, LMSC/VAFB, issues an index of test procedures and vehicle operation instructions to cover AGE launch complex preparations to support the vehicle.

5.4 SATELLITE VEHICLE WORK SCHEDULES

Central Planning and Control, LMSC/VAFB, issues a schedule in bar chart form to cover MAB and pad checkout of the satellite vehicle. A brief summary of the work involved is included.

5.5 SATELLITE VEHICLE MAB CHECKOUT

A brief description of satellite vehicle MAB checkout tasks is set forth in the following subparagraphs.

5.5.1 Receiving Inspection

The vehicle is transferred from the transporter to a working dolly. Access plates are removed. The vehicle is inspected for damage in transit. An audit of paper and parts is made.

5.5.2 SS/B Checks

The propulsion system undergoes a general inspection shortly after arrival. The pressurization system and tank bulkhead are leak checked. A portion of the turbine starter servicing procedure is performed in the MAB.

5.5.3 SS/D Checks

The guidance and flight control subsystem undergoes validation checks. The guidance computer console is checked out with the sequence timer. The pneumatic system is checked for contamination and given a pressurization decay test. The horizon sensor heads are pressure checked.

[redacted]

5.5.4 SS/H Checks

The antenna system and the S Band beacon are checked out. Magnetometer compensation checks are performed.

5.5.5 SS/C Checks

Most SS/C checks are done at the pad. The batteries are activated and tested and the destruct system is checked out and its operation demonstrated to MFSS representative in the MAB.

5.5.6 SS/A Checks

The booster adapter is fit checked to determine non-interference with vehicle parts and shimming requirements. The vehicle is weighed, if required. The alignment of prescribed parts is verified and horizon sensor and engine thrust alignments are made.

5.5.7 Final MAB Preps

At conclusion of SS/A work, the vehicle access plates are emplaced, the vehicle is loaded on a transport trailer and covered for its trip to the pad. Enroute to the pad, life boat guidance and compass rose checks are made.

5.6 SATELLITE VEHICLE PAD CHECKOUT

Upon arrival at the launch pad (VOS) the vehicle is moved from the transporter and placed on a checkout dolly. Access plates are removed and the vehicle prepared for compatibility checks.

5.6.1 All Systems Compatibility

These checks are performed to demonstrate the capability of the AGE to support the vehicle. They consist of the following:

SS/C Power-on Checks

SS/B Landline Transducer Checks

SS/D Guidance and Control Checks

SS/H RF Compatibility Checks

SS/C Pyro Preparations

Lifeboat System Compatibility Checks

5.6.2 Pad Systems Test

After vehicle and launch systems compatibility has been established, preparations are made for the systems run. Test equipment is examined to assure its calibration

5.6.2 Pad Systems Test (Cont'd)

is current. Supporting facilities are made ready to participate in the test. The test consists of a simulated countdown, launch, and flight. The MAB analog station and BTL participate in the test. BTL supplies discrete commands that affect satellite vehicle operation. The payload participates in the test. Recorded data is analyzed to determine systems performance.

5.7 BOOSTER PAD CHECKOUT

The booster is delivered to the pad from the RIM building.

It undergoes the following checks:

- Solid Motor Fit Checks
- Leak Checks
- Electrical Checks
- Hydraulic Checks
- All Systems Run
- Dry Countdown
- Propellant Flow

5.8 AFSSD EVALUATION

AFSSD will review the results of tests, particularly the pad systems test and the DAC flow to determine the readiness of the vehicle for flight and of the launch system to support the launch. Complete or partial tests may be re-run as directed by the 6595th ATW prior to entry into the R minus day pre-launch phase.

5.9 R MINUS DAYS ACTIVITY

R minus days pre-launch activity will occupy five days for SLV-2A vehicles instead of the usual four assigned to SLV-2 vehicles. The additional time is required for the booster solid motor tasks. LMSC activities are listed in the R-Day Book, LMSC 222494 (with applicable vehicle number). The test procedures applicable to the specific R-day tasks are cited in the book.

All items in the R-Day Book must be accomplished and verified or a satisfactory explanation made for those omitted. The working copies of the R-Day Book are delivered to the LMSC launch conductor prior to initiation of countdown.

SECTION VI

COUNTDOWN AND LAUNCH SEQUENCE

6.1 LAUNCH OPERATIONS CONTROL PROCEDURES

The "Program 162 Satellite Orbital Control Paln" TWRCT 62-22, prepared by the 6594th ATW contains a chronology of operating procedures with particular emphasis on satellite control facility functions and on interstation communication affecting the STA, LOCC, VTS and TLM ship during the period of about R-2 day through launch and beyond. The LOCC will keep the STA posted on preparation for launch and countdown progress with particular emphasis on holds and completion of countdown milestones.

6.2 COUNTDOWN

Countdown is accomplished by using the Program 162 Countdown Manual, LMSC 224028, as a guide. The manual is prepared by LMSC/VAFB, under the direction of the LTWG. Figure 6-1 is a typical integrated countdown chart. Countdown will be approximately 480 minutes for SLV-2 boosters and 545 minutes for SLV-2A boosters. It will consist of 18 tasks. During countdown, booster checkout is accomplished by landline from the Control Center and by RF communication with the BTL Ground Guidance Station, MFSS and PMR. Satellite vehicle checkout is accomplished via landline to the Control Center and by RF to the MAB and VTS. Progress of checkout is visually displayed on consoles in the Control Center and is recorded on landline recorders. Countdown evaluations are made at about T-200 and T-60 minutes to review launch readiness. Upon completion of the T-60 evaluation, the terminal count and launch sequence period is entered into.

6.3 LAUNCH SEQUENCE

6.3.1 Sequence of Events, Ascent Phase

The satellite vehicle list of events from liftoff through injection into orbit is set forth in "Sequence of Events, Ascent Phase" under the following LMSC drawing numbers:

Vehicle	LMSC Number	Vehicle	LMSC Number
1159	1350104	1164	1351789
1160	1350105	1165	1351790
1161	1353832	1166	1351791

A brief summary of principle ascent phase events for 1159 and 1160 are covered in the next paragraph.

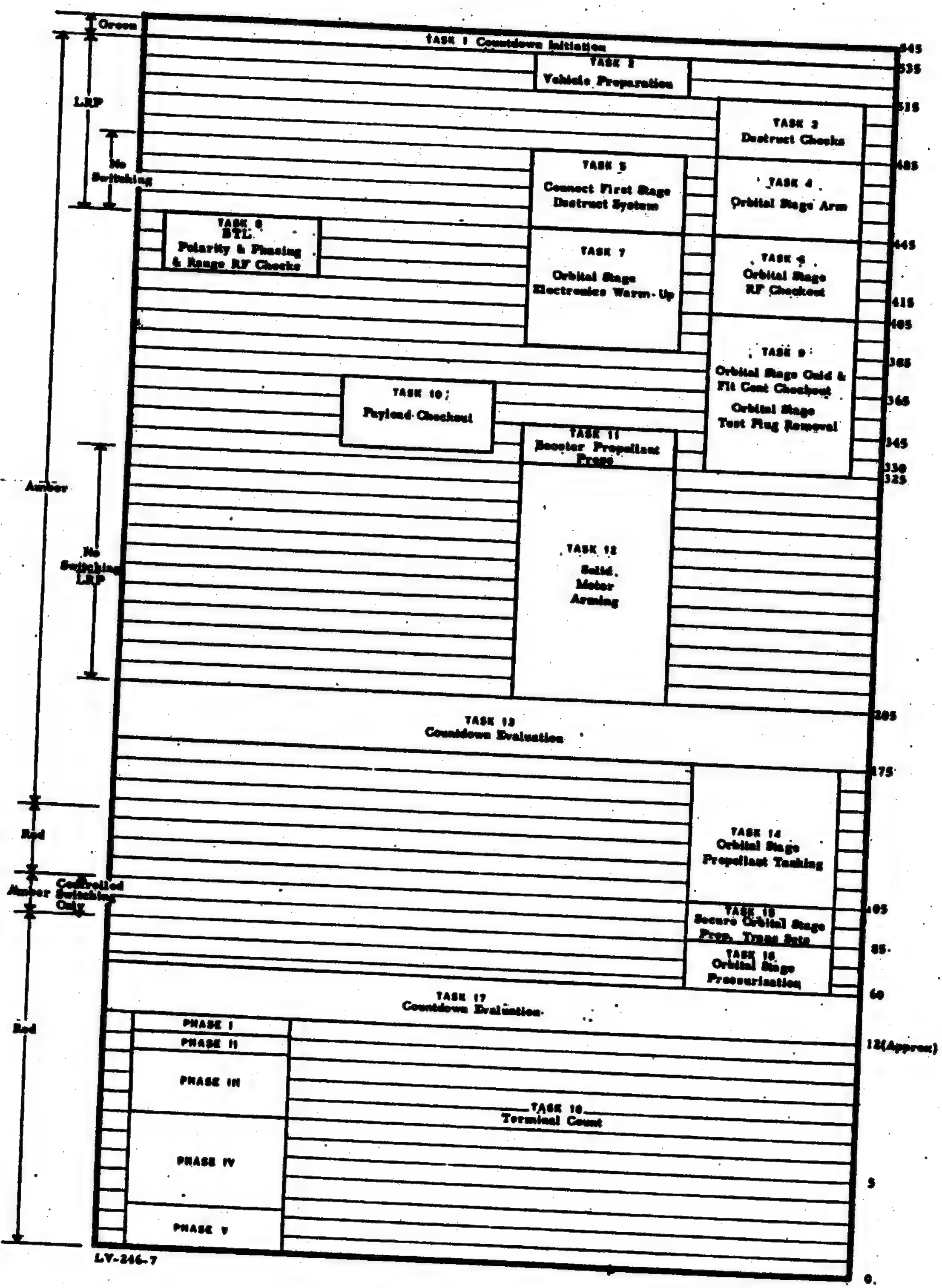
6.3.2 Ascent Phase Events

A brief description of the ascent phase will be included in an early revision.

[redacted]

[redacted]

INTEGRATED MILESTONE COUNTDOWN CHART


Green
LRP
No Switching
Amber
No Switching LRP
Red
Amber
Controlled Switching Only
Red
TASK 1 Countdown Initiation
TASK 2 Vehicle Preparation
TASK 3 Destruct Checks
TASK 4 Orbital Stage Arm
TASK 5 Connect First Stage Destruct System
TASK 6 Orbital Stage RF Checkout
TASK 7 Orbital Stage Electronics Warm-Up
TASK 8 BTL Polarity & Phasing & Range RF Checks
TASK 9 Orbital Stage Guid & Flt Cont Checkout Orbital Stage Test Plug Removal
TASK 10 Payload Checkout
TASK 11 Booster Propellant Press
TASK 12 Solid Motor Arming
TASK 13 Countdown Evaluation
TASK 14 Orbital Stage Propellant Tanking
TASK 15 Secure Orbital Stage Prop. Trans Sets
TASK 16 Orbital Stage Pressurization
TASK 17 Countdown Evaluation
PHASE I
PHASE II
PHASE III
PHASE IV
PHASE V
TASK 18 Terminal Count
545
535
515
485
445
415
405
385
365
345
330
325
205
175
105
85
60
12(Approx)
5
0
LV-246-7

[redacted]

SECTION VII

LAUNCH CRITERIA

7.1 DEFINITION

Launch criteria are requirements for execution of a launch established on the basis of their effect on the objectives. They include range safety, pad conditions, photographic coverage, weather, launch time window, RF interference, range clearance, vehicle systems and launch systems readiness.

7.2 SOURCE OF LAUNCH CRITERIA INFORMATION

This publication and the STO set forth certain launch criteria. In addition, LMSC, Sunnyvale publishes "Launch and Hold Limitations" for S-01A Vehicles, LMSC 1414599A which is applicable to all launches. LMSC A049590 is a comparable publication for S-01 Vehicles. Program peculiar data implementing these publications is usually issued for each launch on R-10 day. A follow-up launch criteria TWX will be issued on R-2 day, if required. These documents include launch weather restrictions, launch time window and other launch data. Information contained in these documents take precedence over any conflicting information that may appear in this document.

7.3 LAUNCH DECISION

The final authority for execution of the launch command is vested in the Launch Controller, 6595th ATW. It is his responsibility to make all decisions where primary and secondary objectives may be affected during the launch countdown. The effect of other variants in the system will be analyzed in the STA and the LOCC will be advised if the launch must be held or aborted for other than launch base determined reasons.

7.4 VEHICLE READINESS

Launch preparations prior to countdown initiation are covered in Section 5. All booster and satellite vehicle systems shall indicate a readiness for launch compatible with flight objectives for the particular launch. Countdown evaluations and confidence checks are made as set forth in Paragraph 6.2.

7.5 PAD CONDITIONS

The DAC Launch Conductor will ascertain that all DAC pre-countdown preparations have been satisfactorily completed prior to the initiation of countdown. LMSC AGE support equipment check list for pad and LOB are contained in the R-minus day schedule prepared by the Launch Systems Engineering Department, LMSC, VAFB. Completion of all items on the list is reported to the LMSC Launch Conductor prior to start of countdown. Launch Conductors will report pad readiness condition to the 6595th Aerospace Test Wing Launch Controller prior to initiation of countdown.

[redacted]

7.6 PHOTOGRAPHIC COVERAGE

7.6.1 Normal Coverage

Photographic coverage of launch and ascent phases is required as set forth in Section 8. Sufficient cameras must be in operation to assure adequate photographic coverage of the launch. Photographic crews with portable equipment will have free access to the launch area within the confines of safety requirements.

7.6.2 Special SLV-2A Coverage

Vehicle 1159/354 and three subsequent launches using SLV-2A boosters will require special tracking film. The film will be ordered through the LTWG. Ideally, this photography will include 6 inch resolution in tracking the solid motors through their ejection and ballistic trajectory.

7.7 WEATHER FORECASTS AND REPORTS

Weather forecasts for the launch area are prepared by Detachment 3, 3rd Weather Wing, VAFB, to determine the probable effect of weather upon launch. These forecasts are transmitted by the Communications Center, VTS to the STA in accordance with schedule contained in Table 7-1. The TLM ship will also furnish weather forecasts to the STA as set forth in that table. Forecast data and subsequent tabular reports of weather conditions, which will be prepared and submitted as set forth in Table 8-5, will become a part of the launch record. Winds aloft readings are taken by the Rawinsonde Station, PMR, Point Arguello and transmitted to PMR Headquarters, Point Mugu, to be relayed to the STA via TWX in accordance with schedule set forth in Table 7-2. This winds aloft information is also passed to the 6595th ATW Data Evaluation Staff via Detachment 3, 3rd Weather Wing.

7.8 WEATHER CONDITIONS

7.8.1 Visibility

For SLV-2A boosted vehicles, downrange visibility must be sufficient to permit optical tracking cameras to cover solid rocket burnout and jetison as set forth in paragraph 7.6.2. Slant range distances will be supplied by DAC. There are no visibility restrictions for SLV-2 boosters.

7.8.2 Precipitation

Precipitation will not be a factor in launch hold or abort unless it affects optical coverage as set forth above.

7.8.3 Surface Wind, SLV-2A Boosters

With both stages fueled and pressurized and solid motors attached, the maximum allowable wind is 63 knots with the booster in toppling condition, i.e., pins out. The limit is 64 knots if t [redacted] are in.

[redacted]

[redacted]-1

WEATHER FORECAST REQUIREMENTS

VAFB/Point Arguello Area

Weather forecasts of the VAFB/Point Arguello area will be made to the STA at the below listed times covering indicated parameters.

FORECAST TIME	COVERAGE
T - 48 hours	Precipitation
T - 24 hours	Surface Wind
T - 12 hours	Visibility
T - 6 hours	Cloud Cover
T - 3 hours	Relative Humidity
T - 2 hours	
T - 1 hour	

TIM SHIP

FORECAST TIME*	COVERAGE**
T - 20 hours	Precipitation
T - 12 hours	Surface Wind
T - 6 hours	Winds Aloft
T - 3 hours	Visibility
T - 1 hour	Cloud Cover
	Sea State

* In addition to these reports, the TIM ships will submit hourly forecasts to the STA from T + 1 until data pickup or return to port, whichever is the earlier.

** Ship position will be reported also.

[redacted]

[redacted]

ABLE 7-2

WIND SHEAR ANALYSIS PROCEDURE

Time (hrs)	Event	Action	Result
T-12	Wind sounding at Arguello from 0 to 32,000 meters	Weather balloon released	Wind profile data obtained
T-9	Wind sounding data transmitted to STA	1. Data fed into 1604 computer (STA)	1. Output analyzed and STA advised of structure analysis results
T-6	Same as T-12	Same as T-12	Same as T-12
T-3	Same as T-9	Same as T-9	Same as T-9
ASAP	Review or structure recommendation based on wind shear analysis	Decision to launch by STA	STA transmits decision to VAFB Launch Controller

1. Vehicle Structure Analysis. The LMSC Structures Organization, 53-18, will review the computer output and with reference to design analysis information, will determine if conditions are within allowable limits of structural capability and available control. The T-12 and T-6 hour programmed flights with wind aloft data inserted, will be analyzed and projected conditions at launch will be determined. If the latter conditions indicate that allowable limits are being approached or have been exceeded, the Structures Organization will so inform the STA. The STA will then request, through the LOCC, a forecast of conditions in the altitude regime of interest for the desired launch time. If the forecast indicates continuing increasing winds, additional wind soundings will be requested and the new data will be used to update the previous launch decision.

2. Direction of wind given in degrees, true and velocity in meters per second for computer input.

3. Observations are furnished for every 300 meters up to 7000 meters altitude and for every 500 (to 600) meters beyond.

7.8.3 Surface Wind, SLV-2A Boosters (Cont'd)

Before fueling and pressurization have been completed, the following surface wind restrictions are applicable:

Loading State	Toppling Condition	Launcher Pins In
Vehicle empty without solid motors	16	46
Vehicle empty with solid motors	32	46
S-01A only loaded, solids attached	37	41
Vehicle loaded, solids attached	37	37

7.8.4 Winds Aloft

Table 7-2 sets forth procedure used by the STA to determine the effects of winds aloft on the vehicle structure. Decision to launch, hold or abort is conveyed to the LOCC by the STA based on wind shear studies.

7.8.5 Wind Drift

Winds aloft readings are used by PMR to predict the probable points of impact of heavy missile parts in case of destruct. The Missile Flight Safety Officer will call a hold if it appears that populous areas may be endangered.

7.9 RADIO FREQUENCY INTERFERENCE

System radio frequencies are monitored by the Frequency Control Division, Range Operations Department, PMR in accordance with PMR Instruction 2400.2. The presence of interfering signals should be reported to the activity using the RF band in which the spurious signal is noted.

7.10 RANGE CLEARANCE

Range clearance confirmation will be issued by the PMR Missile Flight Safety Officer. This clearance will be issued to the Launch Operations Coordinator in the LOCC and will be revocable at any time for sufficient cause.

7.11 VEHICLE TELEMETRY READINESS

7.11.1 Calibration and Checkout

All satellite vehicle telemetry points will be operative for countdown and flight systems test. Booster and satellite vehicle telemetry will be checked out and calibrated prior to launch to determine its readiness. Effort will be made to have all satellite vehicle primary points operative for launch.

7.11.2 Satellite Vehicle Telemetry

The 6595th ATW Evaluation Staff prepares a guide of telemetry measurements to support the launch for use by the Launch Controller, the launch complex, the MAB ground station and the LOCC. The guide consists of three categories.

7.11.2 Satellite Vehicle Telemetry (Cont'd)

Category I is a listing of mandatory measurements (GO/NO-GO) as stipulated by AFSSD. Category II contains pre-launch vehicle status measurements and Category III lists operational control measurements.

7.11.2.1 Satellite Vehicle GO/NO-GO Telemetry

AFSSD, Inglewood, advises the STA of mandatory telemetry measurements during R- minus days. The STA relays this information to the 6595th ATW via TWX about R-2 day. The Evaluation Staff Guide publishes this information for local use under Category I.

7.11.2.2 Satellite Vehicle Category II Telemetry

The guide lists essential pre-launch vehicle status information under Category II. Level of measurements should be checked during countdown and if discrepancies are found, the Launch Controller with be notified. The Launch Controller will conduct an evaluation to determine if improper readings actually represent vehicle status. In addition, the STA will be notified through the LOCC of any discrepancies regardless of action taken.

7.11.2.3 Satellite Vehicle Category III Telemetry

Essential operational control telemetry is listed under Category III in the Guide. Authenticity of these measurements must be verified during countdown and the LOCC should be notified of any discrepancies. The LOCC in turn should notify the STA.

7.11.3 Booster GO/NO-GO Telemetry

Booster GO/NO-GO telemetry measurements are supplied by DAC.

7.12 TRACKING SYSTEMS READINESS

Prior to launch, the operability of the downrange ship will be reported to the STA. The operability of all global tracking stations will be determined by the STA. Should any inadequacy exist of sufficient magnitude to justify holding the launch, the STA will so advise the LOCC. Minimum ground complex capability required for support of ascent and orbital operations is set forth in detail in the OTD. The readiness of the PMR tracking system is determined by the Range Safety Officer.

7.13 BTL GUIDANCE READINESS

Prior to launch, the readiness of the Guidance Station shall be determined by BTL Guidance Control Officer and the LOCC notified accordingly.

7.14 HOLD TIME LIMITATIONS

The satellite vehicle and booster pre-flight preparations are subject to certain restrictions dependent upon the characteristics of the various components and the environmental conditions. Hold time limitations are a guide to be used to indicate the length of time a specified condition is valid and steps to be taken to return the vehicle to launch readiness condition in event that the limit is exceeded. Allowable time from test to test of the various vehicle systems is also specified.

7.14.1 Booster Hold Limitations

Booster hold limitations are published by DAC.

7.14.2 Satellite Vehicle Hold Time Limitations

Satellite vehicle hold limitation data is covered in paragraph 7.2.

SECTION VIII

LAUNCH INSTRUMENTATION AND LAUNCH DATA

8.1 GENERAL

This section discusses the type of launch instrumentation, types of data furnished by the various ground stations and the distribution of data.

8.2 LAUNCH INSTRUMENTATION

8.2.1 Landline Instrumentation

Hardwire instrumentation will be used to monitor certain subsystem operations of both the booster and the satellite. This instrumentation will provide functional information during checkout, pre-launch, and launch operations. Data obtained through the umbilicals will be both visually displayed on the Control Center consoles and graphically recorded. Additional data will be obtained from the satellite test plugs until their removal at about T-330. Booster landline instrumentation and satellite landline recorder channel assignments are set forth in the appropriate Tab.

8.2.2 Telemetry Instrumentation

The booster VHF - FM/FM telemetry link will transmit from time of launch until loss of signal to provide launch and flight information. The satellite will use PAM/FM and FM/FM during the launch phase to monitor and transmit vehicle performance telemetry data for real time and post-test evaluation. The satellite is equipped with UHF command system and Doppler tracking equipment. Telemetry calibration books for each satellite vehicle are prepared and distributed by LMSC, Sunnyvale to stations in the Satellite Control Facility approximately 7 days prior to scheduled launch.

Launch phase telemetry data recorded in the VAFB/Arguello area together with calibration and signal strength records will be distributed as set forth in the data flow chart.

8.2.2.1 Booster Telemetry Schedules

Booster telemetry instrumentation schedules are prepared and distributed by DAC. Copies of booster TLM schedules are set forth in the applicable TAB.

8.2.2.2 Satellite Vehicle Telemetry Schedules

Satellite vehicle telemetry instrumentation schedules are published under LMSC drawing numbers by LMSC, Sunnyvale and revisions are issued as necessary. LMSC, VAFB transmits TWX listings during the period of R-10 to R-0 covering any late changes that have not been formalized by engineering order revising the schedule. Instrumentation schedule numbers for the next scheduled Program 162 satellite vehicles are as follows:

[redacted]

[redacted]

8.2.2.2 Satellite Vehicle Telemetry Schedules (Cont'd)

Satellite Vehicle	Schedule Number
1159	LMSC 1353841
1160	LMSC 1353841
1161	LMSC 1353842
1162	LMSC 1353843
1163	LMSC 1353844
1164	LMSC 1350900
1165	LMSC 1350901
1166	LMSC 1350902

8.2.3 Optical Coverage

Optical coverage includes engineering sequential coverage, Table 8-1; documentary optics coverage, Table 8-2; metric optics tracking coverage, Table 8-3; and PMR photographic film coverage, Table 8-4. Most optical data will include timing correlation. Closed loop television systems provide visual launch information of booster and satellite for Control Center personnel. Vertical wire sky screens and Mark 51 gun sights are used to follow the vehicle flight from launch to limit of visibility for Range Safety observation.

8.2.4 Radar Tracking and Telemetry Tracking Instrumentation

FPN-33 and M33 radar track the vehicle from the launch pad for approximately one mile. These radars render early primary coverage during poor visibility when visual sighting is not possible. The FPS-16, MPS 19 and COTAR systems pick up the track about a mile from the pad. The FPS-16 and MPS-19 radars will provide skin tracking up to the time of satellite separation or maximum range. FPS-16 radar data will be processed for launch coverage reporting as set forth in Table 8-6. The AME COTAR system, used in conjunction with the booster TLM link will provide azimuth and elevation data during early launch period to drive plotboards for range safety requirements.

The TLM-18 antenna system will be used to provide azimuth and elevation data. It will also be used for driving an angle tracker plotboard and as a backup for slaving other antennas. The trihelix antenna system serves as a backup to the TLM-18. Doppler tracking is performed with the VERLORT system.

The Guidance Station in addition to guidance of the booster will supply space position data of the booster. This data will be presented in tabular form and plotted in real-time.

8.2.5 Electromagnetic Radiation Interference Monitoring Instrumentation

The PMR provides ground monitoring stations at Point Mugu, Point Arguello and San Nicolas Island and airborne monitoring stations in the vicinity of the launch pad and along the launch trajectory to guard against interference with the satellite or booster radar and telemetry frequencies. Monitor list for satellite vehicle is covered in the appropriate tab. The booster telemetry codes are included but not guidance and destruct codes.

[redacted]

LOV - Limits of Visibility
FS - First Stage
OS - Orbital Stage

ENGINEERING SEQUENTIAL DETAILED TEST REQUIREMENTS

ITEM NO.	CAMERA POSITION Pad No. 1	2	4	5	FILM SIZE	EMULSION	T- to T/ DURATION		FPS	IMAGE TO FRAME RATIO	OPTIMUM EXPOSURE AREA	COVERAGE
11.1	E	E	A	A	16mm	ECO	15M	5M	24	OS, FS and launcher to fill 2/3 frame	Launcher and Vehicle	Surveillance
11.2	D	D	D	D	16mm	ECO	15M	5M	24	OS, FS and launcher to fill 2/3 frame	Launcher and Vehicle	Surveillance
11.3	B	B	B	B	16mm	ECO	15M	5M	24	OS, FS and launcher to fill 2/3 of frame	Launcher and Vehicle	Surveillance
11.4	C	C	C	C	16mm	ECO	15M	5M	24	OS, FS and launcher to fill 2/3 frame	Launcher and Vehicle	Surveillance
11.5	E	E	E	E	16mm	ER	5S	15S	400	Entire Vehicle and launcher to fill 1/2 frame	Launcher and Vehicle	High Speed Surveillance
11.6	C	C	C	C	16mm	ER	5S	15S	400	Entire Vehicle and launcher to fill 1/2 frame	Launcher and Vehicle	High Speed Surveillance
11.7	M	M	M	M	16mm	ER	5S	5S	400	Upper Sat. Veh. umbilicals fill frame	Upper Umbilical Connections	Umbilical Ejection
11.8	N	N	N	N	16mm	ER	5S	5S	400	Lower Sat. Veh. umbilicals fill frame	Lower Umbilical Connections	Umbilical Ejection
11.9	C	C	C	C	16mm	ER	5S	5S	400	All Sat. Veh. Umbilicals fill frame	All Satellite Veh Connections	Umbilical Ejection
11.10	B	B	B	B	70mm	Ansco-chrome	5S	5S	20	All Satellite Vehicle umb. fill frame	All Satellite Vehicle Connections	Umbilical Ejection
11.11	F	F	F	F	16mm	ECO	5S	15S	200	Main, Vernier and Solid Booster Engines fill frame	Engines - Flame	Ignition - Liftoff
11.12	G	G	G	G	16mm	ECO	5S	15S	200	Main, Vernier and Solid Booster Engines fill frame	Engines - Flame	Ignition - Liftoff
11.13	H	H	H	H	16mm	ECO	5S	15S	200	Vernier Engine fill 3/4 frame	Engine - Flame	Ignition - Liftoff
11.14	J	J	J	J	16mm	ECO	5S	15S	200	Base of First Stage and Launch Deck	Flight Deck Area	Ignition - Liftoff
11.15	I	I	I	I	16mm	ECO	5S	15S	200	Lower Missile and Launcher fill frame	Lower Missile and Launcher	Lower Missile & Launcher - Liftoff
11.16	K	K	K	K	16mm	ECO	5S	15S	200	Base of Umbilical Mast to fill frame	Base of Mast and Deflector Plate	Blast Effects against Base of Mast
11.17	L	L	L	L	16mm	ECO	5S	15S	200	Fuel lines at Base of Launcher to fill frame	Lower left half of Launcher	Blast Effects against Fuel Line & Barco's Joints
11.18	VTS	VTS	VTS	VTS	35mm	B&W	0	LOV	24			Tracking, Telemetry antenna boresight camera - Contractor Operated
11.19	VTS	VTS	VTS	VTS	35mm	B&W	0	LOV	24			Tracking, radar boresight camera - Contractor Operated
11.20	595A - BTL on all pads				16mm	ECO	0	LOV	24			Tracking, radar boresight camera - Contractor Operated
11.21	TS-10	LE-6	TS-6A	TS-2	35mm	ECN	20S	LOV	48	FS Engine Section to fill frame at liftoff	Engine	Tracking
11.22	TS-7	TS-7	TS-8	LE-6	35mm	ECN	20S	LOV	48	FS Engine Section to fill frame at liftoff	Engine	Tracking
11.23	TS-10	LE-6	TS-6A	TS-2	35mm	ECN	20S	LOV	72	FS fills frame at liftoff	Engine & First Stage	Tracking
11.24	TS-7	TS-7	TS-8	LE-6	35mm	ECN	20S	LOV	72	FS fill frame at liftoff	Engine & First Stage	Tracking

LV-121-5

[redacted]

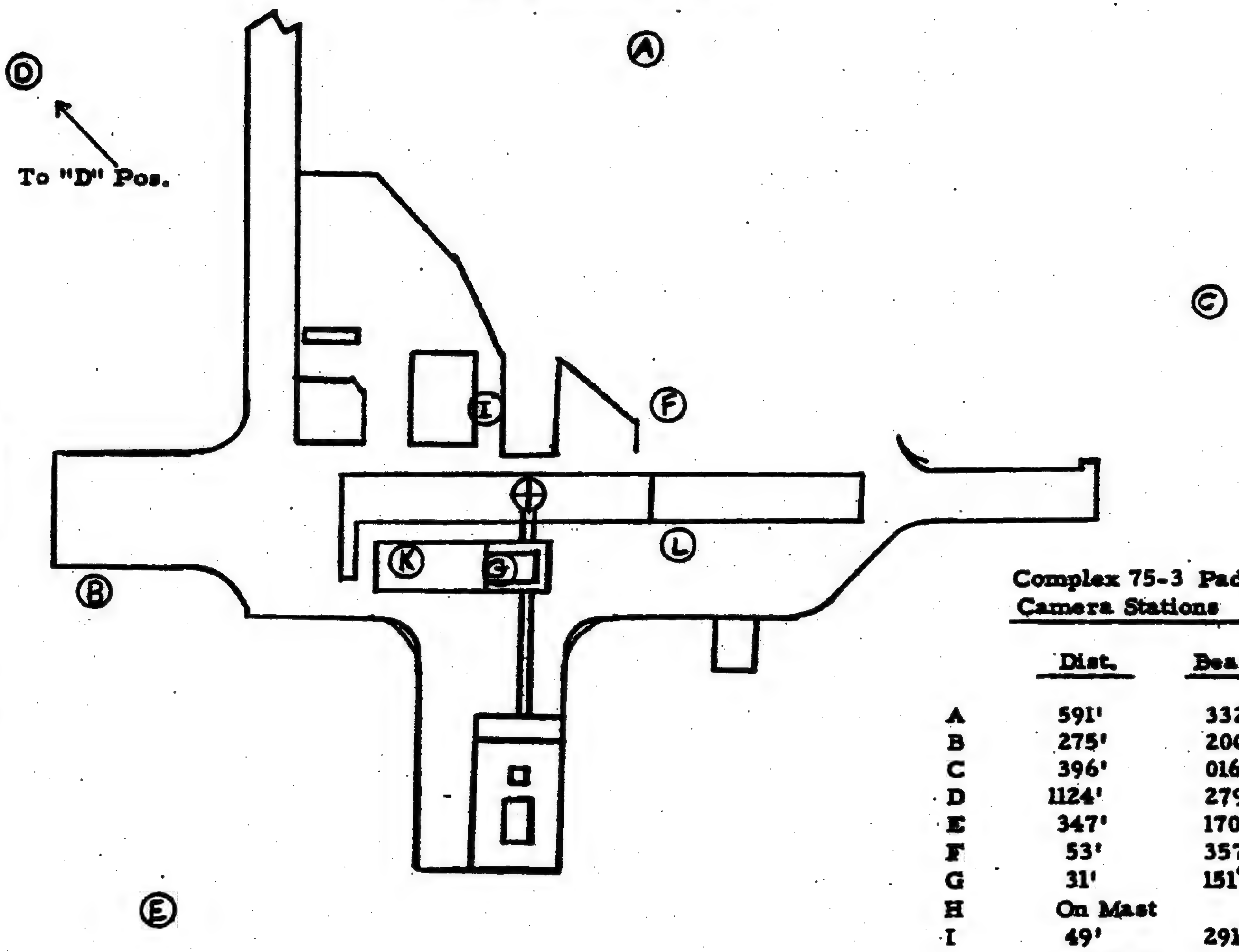
TABLE 8-2

DOCUMENTARY
DETAILED TEST REQUIREMENTS
COMPLEX 75-3 PAD 5

ITEM NO.	CAMERA POSITION	FILM SIZE	EMULSION	DURATION T-	to T+	FPS	IMAGE TO FRAME RATIO	OPTIMUM EXPOSURE AREA	COVERAGE
12.1	TS-2	16mm	ECO	20S	LOV	24	Entire Vehicle to Fill 4/5 Fr. at Liftoff	Missile	Tracking
12.2	LE-6	16mm	ECO	20S	LOV	24	Entire Vehicle To Fill 4/5 Fr. at Liftoff	Missile	Tracking
12.3	TS-8	16mm	ECO	20S	LOV	24	Entire Vehicle to Fill 4/5 Fr. at Liftoff	Missile	Tracking
12.4	TS-2	70mm	Anscochrome	5S	Runout	10	Entire Vehicle to Fill 4/5 Fr. at Liftoff	Missile	Tracking
12.5	B	70mm	Anscochrome	5S	Runout	10	Entire Vehicle to Fill 3/4 Fr. at Liftoff	Missile	Pictorial Liftoff
12.6	B	4x5	Anscochrome	N/A		N/A	Vehicle Fills 2/3 Frame	Missile	Pictorial Liftoff
12.7	A	4x5	Anscochrome	N/A		N/A	Vehicle Fills 2/3 Frame	Missile	Pictorial Liftoff
12.8	E	4x5	B&W	N/A		N/A	Vehicle Fills 2/3 Frame	Missile	Pictorial Liftoff

[redacted]

FIGURE 8-1
PAD 5 CAMERA STATIONS



Complex 75-3 Pad 5 Camera Stations

	Dist.	Bearing
A	591'	332°
B	275'	200°
C	396'	016°
D	1124'	279°
E	347'	170°
F	53'	357°
G	31'	151°
H	On Mast	
I	49'	291°
J	On Mast	
K	55'	199°
L	96'	49°
M	On Mast	
N	On Mast	

[redacted]

TABLE 8-3

METRIC OPTIC DATA REQUIREMENTS

DESCRIPTION OF DATA	SOURCE OF DATA	COVERAGE	ACCURACY	SAMPLE RATE	PRESENTATION	TIME REQUIRED
Space position data*	Best combination of Mitchell, Askania cameras located at PMR phototheodolite sites: VAFB NMFPA Pt. Mugu SNI	Selected points from liftoff to limit of tracking ability	±1.0 mil	1 pt/2 sec	Tabulation of X, Y, Z (ft) vs. time (sec)	T / 24 or T / 32 hrs.
Velocity data*			1 f/s		Vx, Vy, Vz, Vt in ft/sec	
Space position data /		Liftoff to limit of tracking ability	±1.0 mil	4 pts/ sec	Smoothed data tabulation of X, Y, Z (tangent plane coord) (ft vs time (sec); system time in even quarter secs. Plots of X vs Z, X vs Y, X vs T, Z vs T	T / 72 hrs.
Velocity data /			1 f/s		Smooth data tabulation of Vx, Vy, Vz, Vt (ft/sec) (Tangent plane coord) vs time (sec) even quarter secs. Plot of Vr vs T	
Attitude data: Pitch yaw & roll	PMR, MOTU cameras		±2 deg. or better		Tabulation of θ, ψ, and ϕ (deg) vs time from liftoff (sec)	

* If orbital status is not verified after Pass 2, these data are required in T / 24 hours. If orbital status is verified after Pass 2, the time required may be increased to T / 32 hours. TWRCA-3 notifies the 6595th Aerospace Test Wing/VAFB within 8 hours after launch.

/ A cleanup data package will be issued if corrections are necessary after delivery. Distribution of cleanup package will be the same as 72-hour issue. TWRCA-3 will be notified immediately when cleanup package is issued.

LV-174-5

[redacted]

TABLE 8-4

PMR PHOTOGRAPHIC FILM REQUIREMENTS

Camera	Mount	Film	Focal Length	Frames P/S	Coverage
LA-24 Tranquillon Peak		70 mm Ansco	480 in	60	Solid Rockets
MOTU	1 (1)	35 mm 70 mm	300 cm 200 in	64 48	Vehicle Vehicle
MOTU	2 (1)	35 mm 70 mm	120 cm 300 cm	64 48	Vehicle Vehicle

(1) Two MOTU's required.
Each has two cameras.
Mount 1 located Site 5.
Mount 2 located Site 6 or 7.

[redacted]

8.2.6 Weather Instrumentation

Weather data is obtained using Rawinsonde equipment and other standard weather determining equipment.

8.2.7 Miscellaneous Instrumentation

Miscellaneous instrumentation includes equipment for determining weights, center of gravity, separation force, densities, temperatures, voice recording equipment, etc.

8.3 LAUNCH DATA ACQUISITION

8.3.1 Background

The data requirements requested of the Pacific Missile Range and VAFB were established in Program Requirements Document, LMSC B001079. Data requirements of all activities supporting the launch effort and ascent phase of flight are summarized in this section.

8.3.2 Launch Data Sources

Launch data is provided by the following sources:

Vandenberg Tracking Station
Control Center and Missile Assembly Building
BTL Guidance System
LMSC, Sunnyvale
DAC, Santa Monica
Missile Flight Safety System PMR
Detachment 3, 3rd Weather Wing, MATS, USAF, VAFB
Range Support, PMR
1369th Photographic Squadron, USAF, VAFB
Frequency Control Division, PMR
Telemetry Ship

8.3.3 Vandenberg Tracking Station

This station provides telemetry and tracking data reception for launch phase through VERLORT, TLM-18 systems. The following telemetered functions occurring within the range of VTS are TWXed to the STA for computer operation:

MECO
VECO
BTL D-1 on/off command
BTL D-2 on/off command
Separation
Satellite Vehicle Ignition
Satellite Vehicle Burnout

[redacted]

[redacted]

8.3.4 Control Center and MAB

The Control Center and MAB acquire launch data as set forth below:

a. Booster and satellite launch control data is monitored and recorded in the Control Center. Tape recordings are made of selected loops of conversation by DAC and LMSC during countdown in the Control Center.

b. The MAB is equipped with a playback station which is used to produce LTWG analog playbacks following each launch.

Required number of reproducible landline records will be prepared and distributed as set forth in the data flow chart.

8.3.5 BTL Vandenberg

BTL/VAFB supplies plotting board charts, event recorder tabular data, and online printout data. Boresight film is available for loan.

8.3.6 BTL, Whippany

BTL Whippany supplies copies of Plaza tracking data and Jefferson data.

8.3.7 LMSC, Sunnyvale

LMSC, Sunnyvale furnishes the following processed launch data to the LTWG: satellite T/M analog and digital quick look kit, smooth radar plots, radar and Doppler tabulations, and dub magnetic tape of TLM ship telemetry.

8.3.8 DAC Santa Monica

DAC, Santa Monica furnishes the specified number of booster telemetry analog kits and one copy of microfilm of the kit.

8.3.9 Missile Flight Safety System, PMR

Launch data furnished by Missile Flight Safety System PMR, includes the following: flight safety radar plots; FRW-2 UHF commands; COTAR-Plots; COTAR strip charts; COTAR system direction cosine and present position typeouts; MK-51 sky screen strip charts; and, on request of the LTWG, Radsky #1 and #2 photo plots and/or flight safety voice tapes. Table 8-7 sets forth PMR Range Safety data requirements.

8.3.10 Detachment 3, 3rd Weather Wing, USAF, VAFB

Upper air and surface tabular weather data are supplied by Detachment 3, 3rd Weather Wing in accordance with Table 8-5.

[redacted]

TABLE 8-5

LAUNCH WEATHER DATA REQUIREMENTS

Description of Data	Accuracy		Observation Time	Presentation	Time Required
Surface conditions at the launch pad	Precipitation Pressure Temperature Humidity Wind Speed Direction Visibility	±.05 in ±.001" Hg ±1 deg F ±10% ±3.6 knots ±10 deg ±1000 ft	T - 12 hrs. Launch Time	Tabular	T + 10 hours
Upper air conditions (surface to 110,000 ft or to maximum capability of the weather station)	Pressure(1)(2) Temperature(2)(3) Humidity(2)(3) Wind Speed(2)(3) Wind Direction(1)(2) Density(1)(2) Cloud Cover(2)	±1.5 mb above 50,000 ft ±1 deg C Best Obtainable ±3.6 knots ±10 deg ±0.6% ±10%	T - 12 T - 6 Launch Time	Tabular	T + 10 hours T + 72 hours

(1) Required every 1000 ft.
(2) All parameters correlated with tape-line altitude above mean sea level. Cloud cover noted.
(3) Required every 1000 ft to 10,000 ft, every 2000 ft, and every 5000 ft above 20,000 ft.

[redacted]

8.3.11 PMR Range [redacted]port

a. PMR furnishes metric optic data and films in accordance with Tables 8-3 and 8-4.

b. PMR furnishes FPN-33 and M33 short range radar coverage. FPS-16 and MPS-19 radars provide skin tracking coverage from launch to limit of tracking capability. FPS-16 data requirements are summarized in Table 8-6

c. Booster telemetry coverage as set forth in Section 4 of the data flow chart.

8.3.12 1369th Photographic Squadron, USAF, VAFB

Documentary and engineering sequential photographic coverage of launch is provided by Detachment 1, 1369th Photographic Squadron as set forth in Tables 8-1 and 8-2. Requirements are coordinated through the Technical Support Office, 6595th Aerospace Test Wing. Photographic coverage includes the following:

a. Engineering photography

  (1) Instrumentation photography consisting of high and normal speed motion pictures and rapid sequence still photography for gross data analysis purposes with known time reference record exposed on the film.

  (2) Engineering surveillance photography consisting of high and normal speed motion pictures and rapid sequence still photography which does not require time reference.

  (3) Engineering still photography consisting of standard 4 X 5, 2¼ X 2¼, and 35mm photography for engineering purposes.

b. Documentary photography consists of still and motion picture photography utilized for historical purposes, briefing presentations, and progress reports.

8.3.13 RF Frequency Control, PMR

PMR frequency interference control provides a report by TWX to the 6595th ATW summarizing the frequency monitoring results at the time of launch. DAC also receives a written report on RF monitoring results. A transcript of the report is included in the final launch report.

8.3.14 Telemetry Ship

The downrange telemetry ship will receive and record telemetry, radar and Doppler data. The ship will transmit data to the STA in near real time. Telemetry data specified by the STA will be read from telemetry recordings and transmitted to the STA with systems time indicated.

TABLE 8-6

FPS-16 RADAR LAUNCH DATA COVERAGE

Description of Date	Source of Data	Coverage	Accuracy	Sample Rate	Presentation
Space, position and velocity data tabulation*	Best combination of PMR FPS-16 radar sites; preferably including Tranquillon Peak site	From lift-off to limit of tracking ability	1/2 mil Position data to nearest foot	4 pts/sec	X, Y, Z, (ft) versus time (sec) V_x, V_y, V_z, V_t, (ft/sec) versus time (sec)
Space, position and velocity data tabulations**			Velocity data to nearest ft/sec		(a) Smoothed Cartesian coordinate position and velocity data in even quarter-second increments of system time. (b) Smoothed polar coordinate position data referenced to primary FPS-16 radar site and VTS VERLORT site. Time interpolated to even quarter-second increments of system time. (c) Smoothed curvilinear position and velocity components in even quarter-second increments of system time.
Space Position data, punched cards				10 pts/sec	IBM cards containing raw radar data giving slant range, azimuth, and elevation uncorrected for refraction effects, unsmoothed, and referenced to the tracker site. Each card will describe one time-space coordinate. Cover sheet and header card will include identification of each stack of cards, duration of coverage, and timing correlation
Radar plotboard charts and plots or radar tabulations					Annotated plots.

* If orbital status is not verified after Pass 2, these data are required at T + 24 hours. If orbital status is verified after Pass 2, the time required may be increased to T + 32 hours if LMSC/SV notifies the 6595th Aerospace Test Wing, VAFB, within 8 hours after launch.

** A cleanup data package will be issued if corrections are necessary after delivery. Distribution of cleanup package will be the same as 72-hour issue. LMSC (61-44) will be notified immediately when cleanup package is issued.

[redacted]

[redacted]

TABLE 8-7

RANGE SAFETY DATA COVERAGE

Description	Copies Required
Destruct Command Data	2 sets
Transcript of Voice Tapes (on request)	1 set
Flight Safety Plotboards and COTAR Radar & COTAR, Nos. 1, 2, 3, 4, 5, 6 (DTO 1, 2 & 5)	3 sets
COTAR Strip Charts	1 set
MK 51 Sky Screen Strip Charts	1 set
RADSKY 1 and 2 (on request)	1 set

8.3.15 Servicing Notes

Servicing notes are compiled by DAC, VAFB and LMSC, VAFB following each launch. Information included in these reports is as follows:

a. LMSC Servicing Notes contain a brief satellite vehicle chronology, launch weather information, propellant loading and analysis data, pressurization data, air conditioning data, countdown report, and other information as directed by the STA.

b. DAC Servicing Notes contain final booster data including instrumentation data, alignment data and liftoff weight, balance data and other information.

8.4 LAUNCH DATA PROCESSING

This paragraph contains information regarding the processing of launch data prior to distribution. Where applicable, test data will be correlated with systems time and will be annotated for identification, calibration, and interpretation. The processing of booster data will be accomplished by DAC, VAFB and Santa Monica, and copies of data designated in the data flow chart will be furnished to LMSC and other authorized agencies. Certain metric optic and radar data will be processed by PMR. Engineering sequential and documentary launch films will be processed by USAF at VAFB. Satellite and raw payload data will be processed by LMSC data services.

8.5 LAUNCH DATA DISTRIBUTION

8.5.1 Landline Data

Landline records will be distributed in accordance with the data flow chart. Copies will be made of reproducible satellite vehicle records as required.

8.5.2 Telemetered Data

Specified telemetry data will be transmitted via the microwave link between the Vandenberg Tracking Station and the STA. The data will be also recorded for delivery to LMSC, Sunnyvale as set forth in the data flow chart.

8.5.3 Data Flow Chart

The data flow chart consists of a tabular presentation of launch data distribution. A data log sheet is prepared for each launch by the 6595th Aerospace Test Wing, VAFB. It is used to record receipt and delivery of launch data by that activity. Item numbers and nomenclature on the data log sheet agree with those appearing in the data flow chart. Data identification information is usually printed on labels which are pasted to the launch data documents. Data flow chart is included at the end of this section as Table 8-8.

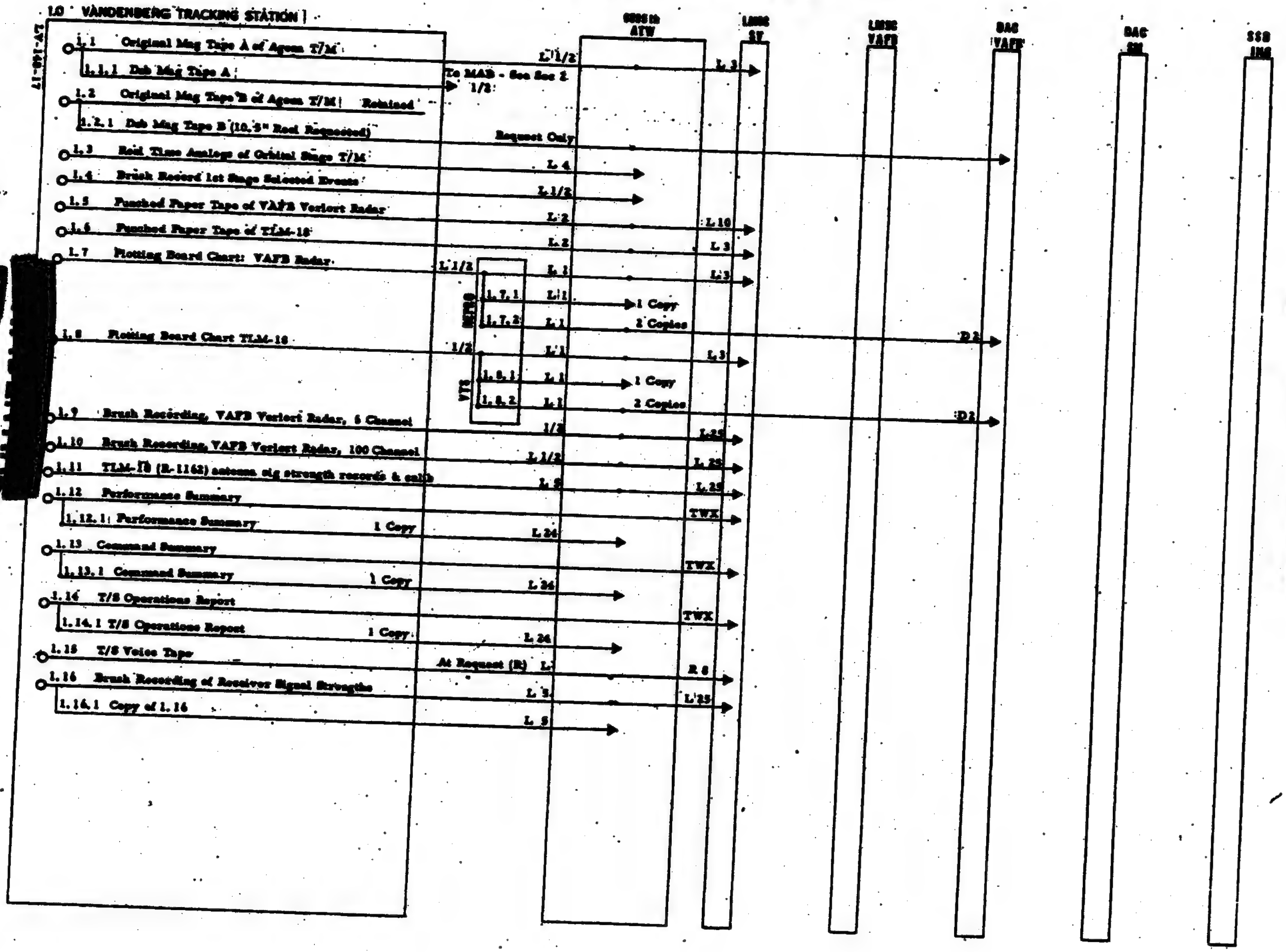
8.5.4 Data Handling

Every effort will be made to deliver test data within the allowed time limit. Unavoidable deviations will be coordinated with 6594th Aerospace Test Wing, Code TWRCA-3 and reported to the 6595th Aerospace Test Wing and to LMSC, Sunnyvale, Department 61-44. An inventory will accompany each shipment. Couriers will be designated as necessary to deliver flight test data in accordance with data flow schedule. Normal courier service from VAFB to Sunnyvale will be utilized where practicable, when special couriers are not assigned. Data that is not available for courier delivery will be transmitted by certified mail.

[redacted]

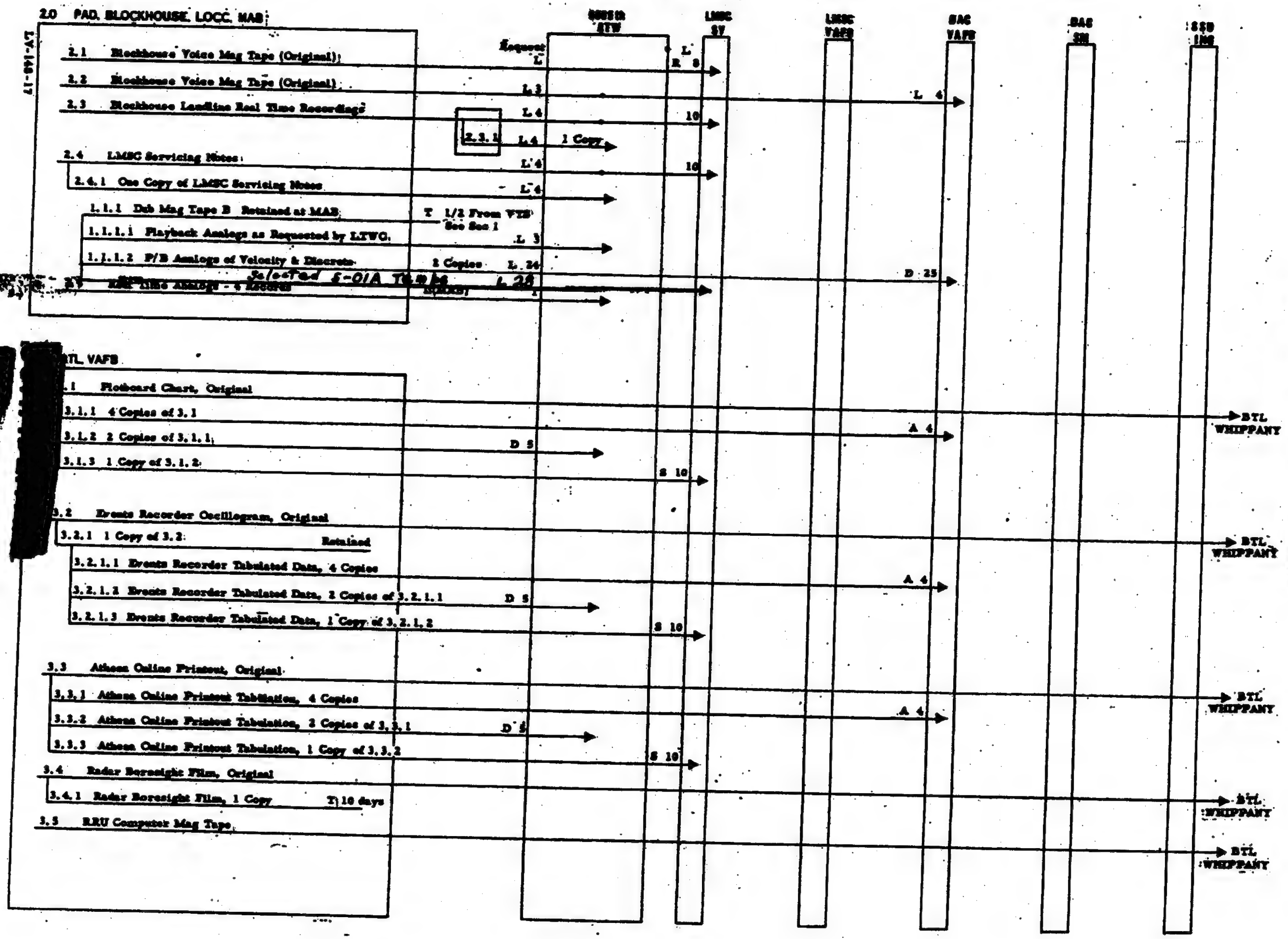
TABLE 8-8

FLIGHT TEST LAUNCH DATA FLOW


1.0 VANDENBERG TRACKING STATION
LV-140-17
6555th ATW
LMSC SV
LMSC VAFB
DAC VAFB
DAC SM
SSD INS
1.1 Original Mag Tape A of Agena T/M
L 1/2
L 3
1.1.1 Dub Mag Tape A
To MAD - See Sec 2
1/2
1.2 Original Mag Tape B of Agena T/M
Retained
1.2.1 Dub Mag Tape B (10.5" Reel Requested)
Request Only
1.3 Real Time Analog of Orbital Stage T/M
L 4
1.4 Brush Record 1st Stage Selected Events
L 1/2
1.5 Punched Paper Tape of VAFB Verlort Radar
L 2
L 10
1.6 Punched Paper Tape of TLM-18
L 2
L 3
1.7 Plotting Board Chart: VAFB Radar
L 1/2
L 1
L 3
NMRO
1.7.1
L 1
1 Copy
1.7.2
L 1
2 Copies
D 2
1.8 Plotting Board Chart TLM-18
1/2
L 1
L 3
VTS
1.8.1
L 1
1 Copy
1.8.2
L 1
2 Copies
D 2
1.9 Brush Recording, VAFB Verlort Radar, 6 Channel
1/2
L 25
1.10 Brush Recording, VAFB Verlort Radar, 100 Channel
L 1/2
L 25
1.11 TLM-18 (R-1162) antenna sig strength records & calib
L 5
L 25
1.12 Performance Summary
TWX
1.12.1 Performance Summary
1 Copy
L 24
1.13 Command Summary
TWX
1.13.1 Command Summary
1 Copy
L 24
1.14 T/S Operations Report
TWX
1.14.1 T/S Operations Report
1 Copy
L 24
1.15 T/S Voice Tape
At Request (R)
L 1
R 8
1.16 Brush Recording of Receiver Signal Strengths
L 5
L 25
1.16.1 Copy of 1.16
L 5

[redacted]

TABLE 8-8 (Cont'd)

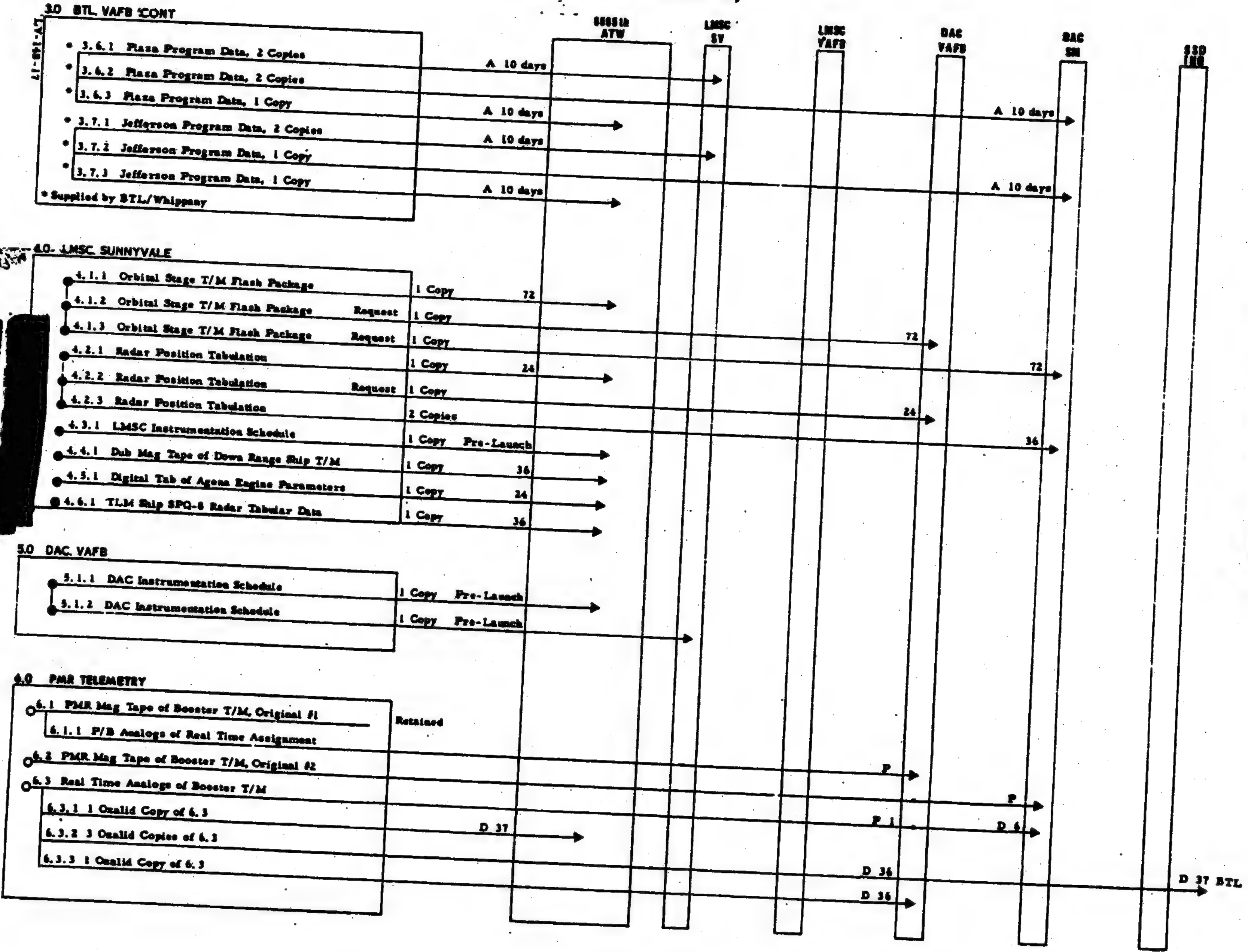

LV-148-17
2.0 PAD, BLOCKHOUSE, LOCC, MAB
6555th STW
LMSC SV
LMSC VAFB
SAC VAFB
SAC SM
SSD IMG
Request L
2.1 Blockhouse Voice Mag Tape (Original)
L R 8
2.2 Blockhouse Voice Mag Tape (Original)
L 3
L 4
2.3 Blockhouse Landline Real Time Recordings
L 4
10
2.3.1
L 4
1 Copy
2.4 LMSC Servicing Notes
L 4
10
2.4.1 One Copy of LMSC Servicing Notes
L 4
1.1.1 Dub Mag Tape B Retained at MAB
T 1/2 From VTS See Sec 1
1.1.1.1 Playback Analogs as Requested by LTWG.
L 3
1.1.1.2 P/B Analogs of Velocity & Discrete
2 Copies
L 24
D 25
Selected S-01A Temps
L 28
Real Time Analogs - 4 Records
3.0 BTL VAFB
3.1 Plotboard Chart, Original
BTL WHIPPANY
3.1.1 4 Copies of 3.1
A 4
3.1.2 2 Copies of 3.1.1
D 5
3.1.3 1 Copy of 3.1.2
S 10
3.2 Events Recorder Oscillogram, Original
BTL WHIPPANY
3.2.1 1 Copy of 3.2
Retained
3.2.1.1 Events Recorder Tabulated Data, 4 Copies
A 4
3.2.1.2 Events Recorder Tabulated Data, 2 Copies of 3.2.1.1
D 5
3.2.1.3 Events Recorder Tabulated Data, 1 Copy of 3.2.1.2
S 10
3.3 Athena Online Printout, Original
BTL WHIPPANY
3.3.1 Athena Online Printout Tabulation, 4 Copies
A 4
3.3.2 Athena Online Printout Tabulation, 2 Copies of 3.3.1
D 5
3.3.3 Athena Online Printout Tabulation, 1 Copy of 3.3.2
S 10
3.4 Radar Boresight Film, Original
BTL WHIPPANY
3.4.1 Radar Boresight Film, 1 Copy
T 10 days
3.5 RRU Computer Mag Tape
BTL WHIPPANY

[redacted]

TABLE 8-8 (Cont'd)

[redacted]

[redacted]


6555th ATW
LMSC SV
LMSC VAFB
DAC VAFB
DAC SM
SSD ING
LV-148-17
3.0 BTL VAFB CONT
* 3.6.1 Plaza Program Data, 2 Copies
* 3.6.2 Plaza Program Data, 2 Copies
* 3.6.3 Plaza Program Data, 1 Copy
* 3.7.1 Jefferson Program Data, 2 Copies
* 3.7.2 Jefferson Program Data, 1 Copy
* 3.7.3 Jefferson Program Data, 1 Copy
* Supplied by BTL/Whippany
A 10 days
A 10 days
A 10 days
A 10 days
A 10 days
A 10 days
4.0 LMSC SUNNYVALE
4.1.1 Orbital Stage T/M Flash Package
4.1.2 Orbital Stage T/M Flash Package
4.1.3 Orbital Stage T/M Flash Package
4.2.1 Radar Position Tabulation
4.2.2 Radar Position Tabulation
4.2.3 Radar Position Tabulation
4.3.1 LMSC Instrumentation Schedule
4.4.1 Dub Mag Tape of Down Range Ship T/M
4.5.1 Digital Tab of Agena Engine Parameters
4.6.1 TLM Ship SPQ-8 Radar Tabular Data
Request
Request
Request
1 Copy
1 Copy
1 Copy
1 Copy
1 Copy
2 Copies
1 Copy
1 Copy
1 Copy
1 Copy
72
72
72
24
24
36
Pre-Launch
36
24
36
5.0 DAC VAFB
5.1.1 DAC Instrumentation Schedule
5.1.2 DAC Instrumentation Schedule
1 Copy Pre-Launch
1 Copy Pre-Launch
6.0 PMR TELEMETRY
6.1 PMR Mag Tape of Booster T/M, Original #1
6.1.1 P/B Analogs of Real Time Assignment
6.2 PMR Mag Tape of Booster T/M, Original #2
6.3 Real Time Analogs of Booster T/M
6.3.1 1 Ozalid Copy of 6.3
6.3.2 3 Ozalid Copies of 6.3
6.3.3 1 Ozalid Copy of 6.3
Retained
P
P
P 1
D 6
D 37
D 36
D 36
D 37 BTL

[redacted]

TABLE 8-8 (Cont'd)

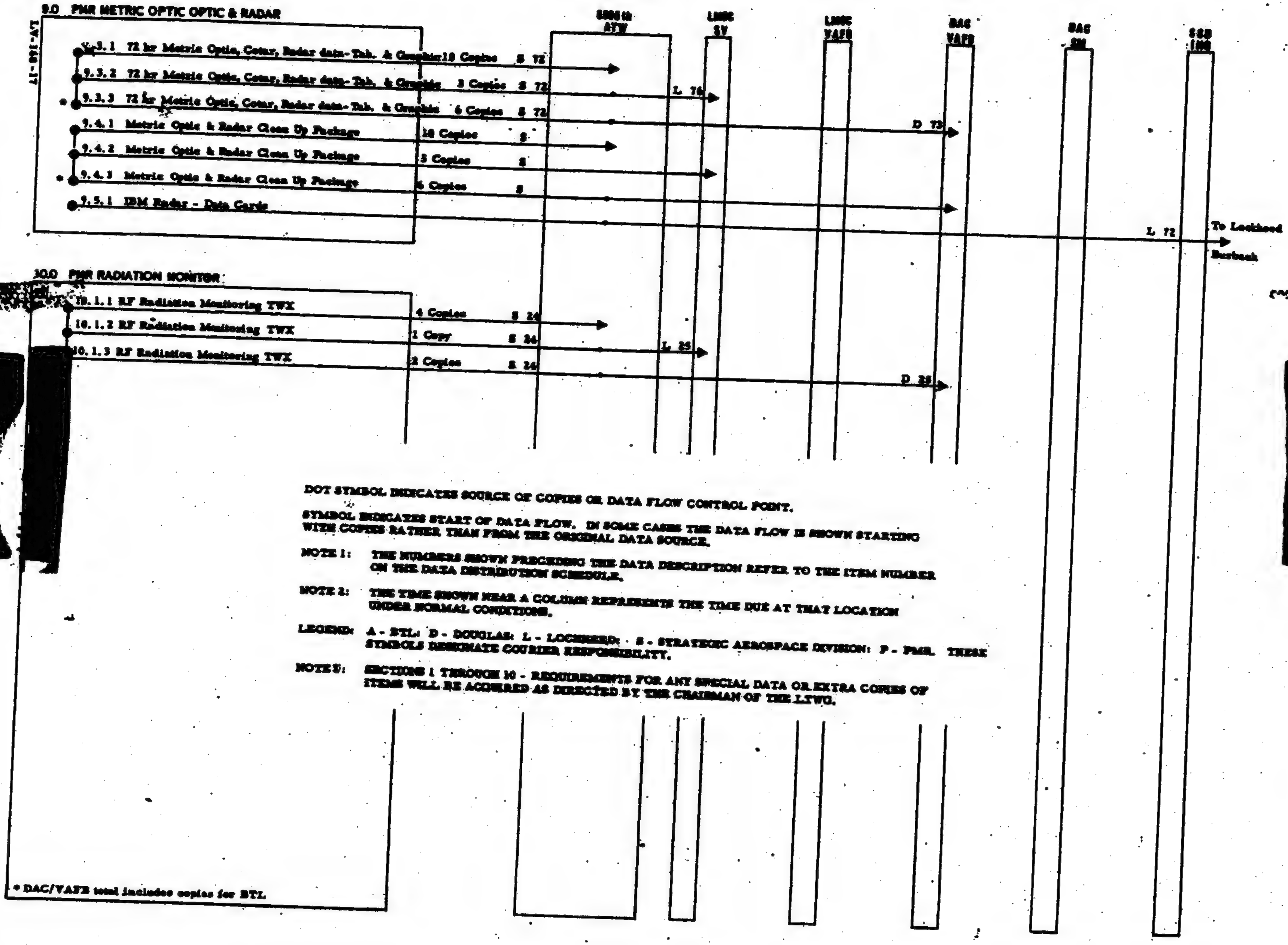
LY-146-17

			6595th ATW	LMSC SV	LMSC VAFB	DAC VAFB	DAC SM	SSD INS	
6.3.4 1 Ozalid Copy of 6.3				D 36 →					
6.3.5 1 Ozalid Copy of 6.3									D 36 Rocketdyne
7.0 FLIGHT SAFETY									
7.1.1 Radar & Cotar Plotboard Charts Nos. 1, 2, 3, 4, 5, 6	1 Copy each	P 1	→						
7.1.2 1 Copy each Chart of 7.1.1		L 24		L 28 →					
7.1.3 1 Copy each Chart of 7.1.1		R 4				→			
7.2.1 Real Time CDT FRW-2 UHF Commands 2 Copies		P 2	→						
7.2.2 Real Time CDT FRW-2 UHF Commands, 2 Copies				S 10 →					
[redacted]3 Flight Safety Voice Tapes		P Request	→						
[redacted].4.1 Cotar Strip Chart, 1 Copy		P 4	→						
.5.1 MK-51 Skyscreen Strip Chart		P 2	→						
.6.1 Radsky No. 1 & 2 Photo Plots		P Request	→						
[redacted]AFB WEATHER DETACHMENT 3, 3RD WEATHER WING									
8.1.1 Upper Air Launch Weather Tabular Data	1 Copy	S 4	→						
8.1.2 Upper Air Launch Weather Tabular Data	2 Copies	S 4		L 10 →					
8.1.3 Upper Air Launch Weather Tabular Data	1 Copy	S 4				D 5 →			
8.2.1 Upper Air & Surface Launch Weather Tabular Data		S 72	→						
8.2.2 Upper Air & Surface Launch Weather Tabular Data	2 Copies	S 72		L 76 →					
* 8.2.3 Upper Air & Surface Launch Weather Tabular Data	6 Copies	S 73				→			
9.0 PMR METRIC OPTIC & RADAR									
9.1.1 Metric Optic Films, 3 sites, 3 Copies on site		S 48	→						
9.1.2 Metric Optic Films, 3 sites, 1 Copy on site		S 48		L 92 →					
9.1.3 Metric Optic Films, 3 sites, 1 Copy on site		S 48				D 49 →			
9.2.1 Metric Optic & Radar 24 Hour Tabular Data	8 Copies	S 24	→						
9.2.2 Metric Optic & Radar 24 Hour Tabular Data	1 Copy	S 24		L 28 →					
* 9.2.3 Metric Optic & Radar 24 Hour Tabular Data	6 Copies	S 24				D 25 →			

* DAC/VAFB total includes copies for BTL.

[redacted]

TABLE 8-8 (Cont'd)


LV-148-17
9.0 PMR METRIC OPTIC OPTIC & RADAR
9.3.1 72 hr Metric Optic, Cotar, Radar data- Tab. & Graphic 10 Copies S 72
9.3.2 72 hr Metric Optic, Cotar, Radar data- Tab. & Graphic 3 Copies S 72
* 9.3.3 72 hr Metric Optic, Cotar, Radar data- Tab. & Graphic 6 Copies S 72
9.4.1 Metric Optic & Radar Clean Up Package 10 Copies S
9.4.2 Metric Optic & Radar Clean Up Package 3 Copies S
* 9.4.3 Metric Optic & Radar Clean Up Package 6 Copies S
9.5.1 IBM Radar - Data Cards
10.0 PMR RADIATION MONITOR
10.1.1 RF Radiation Monitoring TWX 4 Copies S 24
10.1.2 RF Radiation Monitoring TWX 1 Copy S 24
10.1.3 RF Radiation Monitoring TWX 2 Copies S 24
6595th ATW
LMSC SV
LMSC VAFB
DAC VAFB
DAC SM
SSD ING
L 76
D 73
L 72
To Lockheed Burbank
L 25
D 25

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SYMBOL INDICATES START OF DATA FLOW. IN SOME CASES THE DATA FLOW IS SHOWN STARTING WITH COPIES RATHER THAN FROM THE ORIGINAL DATA SOURCE.

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NOTE 2: THE TIME SHOWN NEAR A COLUMN REPRESENTS THE TIME DUE AT THAT LOCATION UNDER NORMAL CONDITIONS.

LEGEND: A - BTL; D - DOUGLAS; L - LOCKHEED; S - STRATEGIC AEROSPACE DIVISION; P - PMR. THESE SYMBOLS DESIGNATE COURIER RESPONSIBILITY.

NOTE 3: SECTIONS 1 THROUGH 10 - REQUIREMENTS FOR ANY SPECIAL DATA OR EXTRA COPIES OF ITEMS WILL BE ACQUIRED AS DIRECTED BY THE CHAIRMAN OF THE LTWG.

* DAC/VAFB total includes copies for BTL.

[redacted]

SECTION IX

LAUNCH REPORTS

9.1 GENERAL INFORMATION

Reports are rendered by VAFB activities to cover launch phase of each flight. These reports vary from commentary passed by hot line and TWX to a formal publication prepared after extensive analysis.

9.2 LAUNCH PROGRESS INFORMATION

Hot line is used to convey launch progress information from the LOCC to the STA. The LOCC furnishes early launch information to AFSSD, Inglewood by TWX.

9.3 FLASH LAUNCH REPORT

A TWX report is prepared by the 6595th ATW covering preliminary evaluation of launch data. It includes a brief description of launch operations, a preliminary operational evaluation of each vehicle subsystem and launch facility system, and a report of significant ascent events through injection into orbit. It is due 8 hours after launch.

9.4 FINAL LAUNCH REPORT

The Final Launch Report is prepared by the Evaluation Staff for the 6595th ATW. It provides a formal documentation and evaluation of launch operations and results. It contains pertinent launch data, vehicle history, and other details. Evaluation is made by correlating actual launch results with predicted nominal performance. Inputs are contributed by the LTWG, PMR, DAC, LMSC, and other contractors. The report is due 14 days after launch. LMSC/VAFB distributes the report to LMSC activities, and the 6595th ATW is responsible for delivery of remainder.

9.5 DAC/VAFB LAUNCH REPORTS

DAC/VAFB submits the following reports to distribution determined by DAC.

9.5.1 DAC Flash Report

The DAC Flash Report is the first formal evaluation report of the booster countdown and flight will include data and evaluation developed at the first DAC post launch critique. It is due at T + 8 working hours.

9.5.2 DAC Engineering Test Summary

The Data Engineering Test Summary contains data analysis, upper air weather tabulations, oscillograph records of in-flight telemetry and critique of photographic data. It is issued two working days after launch.

[redacted]

[redacted]

9.5.3 DAC Preliminary Flight Report

This report is issued seven working days after launch. The report will include summaries of booster flight data, a description of the countdown and contractors' preliminary evaluations and recommendations. Extracts from it are used in preparing the Final Launch Report covered in paragraph 9.4.

[redacted]

TAB 45

CONTENTS

		PAGE
1	Introduction	45-1
2	Flight Test Information	45-2
3	Booster 354 Flight Plan	45-3
4	RF Monitor List	45-4
5	Satellite Vehicle Landline Instrumentation Schedule	45-5
6	Booster Landline Instrumentation Schedule	45-6
7	Booster Telemetry Instrumentation Schedule	45-8

[redacted]

INTRODUCTION

This tab covers the launch of SLV-2A booster 354, mated to S-01A satellite vehicle 1159. Tab number assigned (number 45) is the next number in the sequence carried forward from LMSC 445925-C. The vehicle is scheduled to launch from Complex 75-3, Pad 5, which has been configured accordingly. It will be the first LMSC satellite vehicle launch utilizing the SLV-2A booster. The usual pad R-minus day period of four days has been extended to five days for booster solid rocket attachment.

Tracking camera and visibility requirements for launch are changed to enable observation of solid rocket performance as set forth in section 8. Photographic requirements and camera location data have been changed recently and are reflected in optical data charts.

Recovery of one of these solid booster motors is desired, if it is floating.

Distribution of this tab was made with the basic document.

[redacted]

[redacted]

LMSC 445925 D
TAB 45
1159/354

FLIGHT TEST INFORMATION

Booster	
Satellite vehicle	SLV-2A serial 354
Launch pad	S-01A serial 1159
Pad azimuth	75-3 Pad 5
Launch azimuth	218.4 DEG.
Perigee	175 DEG.
Orbit inclination angle	90 N. M.
Period	75 DEG.
Scheduled launch date	90.7 MIN.
Launch window	23 February 1963
Gross lift-off weight	1300 to 1400 PST
	152,847 LBS. *

* Weight is based on information released on 11 January 1963, may vary slightly from final weighing.

Reference: Above information with exception of launch date and window were obtained from LMSC, Sunnyvale TWX P 181803Z of January 1963 as ammended by LMSC, Sunnyvale letter A 317020 of 24 January 1963.

[redacted]

BOOSTER 354

FLIGHT PLAN

The flight controller program for the primary trajectory is:

Time (sec)	Programmer Rates (deg/sec) Roll	Pitch	Yaw
0 to 2	0	0	0
2 to 6	+5.387	0	0
6 to 10	+5.387	-4.056	-0.799
10 to 55	0	-0.669	0
55 to 80	0	-0.493	0
80 to 89.85	0	-0.264	-0.799
89.85 to 92	0	-0.264	0
91 to 91.78	+5.387	-0.264	0
91.78 to 130	0	-0.264	0
130 to burnout	0	0	0

The flight control system will be arranged for the following plan of events:

Time	Timed Event
T + 55 sec	Enable separation circuitry (solid motors)
T + 70 sec	Solid motor separation; Roll gain change
T + 80 sec	Solid motor separation backup signal; Guidance enabled
T + 102 sec	Enable vernier engine yaw movement; Main engine gain change
T + 138 sec	MECO enable

[redacted]

[redacted]

R. F. MONITOR LIST

SATELLITE VEHICLE

EQUIPMENT	CODE
Vehicle Link I	T-60
Vehicle Link II	T-59
Vehicle Link IV	T-28
Acquisition Beacon	T-25
Capsule TLM	T-59
Capsule Beacon and Drop Marker	T-65
VERLORT Receiver	S-30 D
VERLORT Transmitter	S-68 P
Auxiliary Command System	V-89
Special Projects Command	V-95

BOOSTER

TLM Kit 1	T-10
TLM Kit 2	T-61

[redacted]

[redacted]

BOOSTER 354 LANDLINE INSTRUMENTATION SCHEDULE

GROUND MONITOR SYSTEM

Function	Range	Nominal Values
Main liquid oxygen tank pressure	0-50 psig	33 psig
Main fuel tank pressure	0-50 psig	28 psig
Nitrogen storage tank bottle pressure	0-8,000 psig	6,000 psig
High-pressure missile bottle pressure	0-5,000 psig	3,000 psig
Vernier fuel start tank pressure	0-1,000 psig	646 psig
Vernier liquid oxygen start tank pressure	0-1,000 psig	646 psig
Engine regulator discharge pressure	0-800 psig	646 psig
Liquid oxygen storage tank pressure	0-150 psig	71 psig
Fuel storage tank pressure	0-150 psig	53 psig
Control manifold pressure	0-200 psig	135 psig
Transducer 5-volt supply	0-10 volts	5 volts
Hydraulic return pressure	0-200 psig	80 psig

BOOSTER 354 LANDLINE INSTRUMENTATION SCHEDULE

EVENTS RECORDER, CHANNEL ASSIGNMENTS

Channel	Event
1	Base timing
2	Power on (sequence initiation)
3	Phase completion (resets automatically)
4	Flight controller on
5	Fuel storage tank vent valve closed
6	Control manifold pressurizing valve open
7	Missile bottles pressurizing valve open
8	Lox storage tank vent valve closed
9	Lox storage tank pressurizing valve open
10	Hydraulics normal
11	Engine centered
12	Engine off center
13	Engine recentered
14	Launcher hydraulics normal
15	Missile bottles pressurized
16	Engine purge on
17	Main fuel tank vent valve open
18	Fuel storage tank pressurizing valve open
19	Fuel fine load valve open
20	Lox fine load valve open
21	Lox rapid load valve open
22	Fuel rapid load valve open
23	Main lox tank vent valve open
24	97% fuel
25	100% fuel
26	Main fuel tank pre-pressurizing valve open
27	BTL guidance on internal power
28	95% lox
29	Inverter on
30	Inverter on internal
31	Flight controller on internal
32	Booster on internal power
33	Launcher clear to fire
34	Lox transfer resume
35	Main lox tank vent valve boost close
36	Main lox tank pre-pressurizing valve open
37	99% lox
38	100% lox
39	Main propellant tanks pressurized
40	Propellant transfer complete
41	Engine start
42	Liftoff
43	Technical hold imposed
44	Malfunction
45	Propellant hold over-ride
46	Flight controller and hydraulics over-ride
47	Phase V hol[redacted]
48	"Proceeding [redacted]
49	Liftoff sig[redacted]
50	Internal ti[redacted]

CHANNEL ASSIGNMENTS, IN-FLIGHT TELEMETRY

FM/FM Channels, Kit No. 1

FM/FM Channel	Center Frequency	Function	Range
~~7~~	~~2.3~~	~~Solid motor chamber pressure, low range, motor No. 3~~	Not assigned ~~0 to 100 psia~~
8	3.0	Vernier engine No. 2 chamber pressure	0 to 500 psia
9	3.9	Combined BTL commands	0 to 5 volts
10	5.4	Main engine chamber pressure	0 to 800 psia
11	7.35	Sequence No. 1: fuel & lox float switches, MECO, VECO	0 to 5 volts
12	10.5	Magnetron current (BTL)	0 to 100%
13	14.5	Vibration, pitch axis, low level, forward thrust structure, solid motor	± 3 g
A	22.0	Solid motor chamber pressure, high range, motor No. 3	0 to 800 psia
C	40.0	Vibration, longitudinal axis, high level, gimbal block area	0 to 1,200 cps
E	70.0	Subcommutated to 45 PDM channels	See 6.1.3

Table 6.1.2 FM/FM Channels, Kit No. 2

FM/FM Channel	Center Frequency	Function	Range
7	2.3	Sequence 3: solid motor removals: No. 1, No. 2, & No. 3	0 to 5 volts
8	3.0	Sequence 2: ignition switches 1 & 2 pickup; separation signals (primary & backup)	0 to 5 volts
9	3.9	Vehicle axial acceleration	0 to 8 g
~~10~~	~~5.4~~	~~Solid motor chamber pressure, low range, motor No. 2~~	Not assigned ~~0 to 100 psia~~
11	7.35	Solid motor chamber pressure, high range, motor No. 1	0 to 800 psia
12	10.5	Vibration, longitudinal axis, low level, engine gimbal block	± 12 g
13	14.5	Vibration, pitch axis, low level, aft thrust structure, solid motor	± 3 g
A	22.0	Solid motor chamber pressure high range, solid motor No. 2	0 to 800 psia
C	40.0	Vibration, pitch axis, high level, junctio[redacted]x between thrust beams	0 to 1,200 cps
E	70.0	Subcommu[redacted]o 45 PDM channels	See 6.1.4

[redacted]

LMSC 445925-D
Tab 45
1159/354

BOOSTER 354 TELEMETRY INSTRUMENTATION SCHEDULE

PDM Channel Assignments, Kit No. 1

Channel	Function	Range
1	5-volt absolute	0 to 5 volts
2	Instrumentation ground	0 to 5 volts
3	Main engine pitch position	± 2 degrees
4	Main engine yaw position	± 2 degrees
5	Vernier engine No. 1 pitch position	± 45 degrees
6	Vernier engine No. 1 yaw position	-8 to -28 deg
7	Vernier engine No. 2 pitch position	± 45 degrees
8	Vernier engine No. 2 yaw position	+8 to +28 deg
9	Pitch attitude error	± 4 degrees
10	Roll attitude error	± 4 degrees
11	Yaw attitude error	± 6 degrees
12 & 34	Pitch rate	± 4 deg/sec
13 & 35	Yaw rate	± 3.5 deg/sec
14 & 36	Roll rate	± 8 deg/sec
15	Pitch command	± 4 deg/sec
16	Yaw command	± 3.5 deg/sec
17	Actuator potentiometer positive voltage	0 to 30 volts
18	Actuator potentiometer negative voltage	-13 to -30 volts
19	400-cps voltage, phase A control inverter	110 to 120 v
20	5-volt potentiometer excitation	0 to 5 volts
21	Automatic gain control (BTL)	0 to -90 dbm
22	Input supply voltage (BTL)	20 to 36 volts
23	Missile battery voltage	0 to 32 volts
24	Telemetry battery voltage	0 to 32 volts
25	Hydraulic supply pressure	0 to 4,000 psia
26	Hydraulic return pressure	0 to 200 psia
27	Turbopump speed	0 to 8,000 rpm
28	Turbine inlet temperature	0 to 1,500 deg F
29	Fuel pump inlet pressure	0 to 200 psia
30	Static pressure, PX-1	0 to 15 psia
31	Static pressure, PX-2	0 to 15 psia
32	Static pressure, PX-3	0 to 15 psia
33	Static pressure, PX-4	0 to 15 psia
12 & 34	Pitch rate	± 4 deg/sec
13 & 35	Yaw rate	± 3.5 deg/sec
14 & 36	Roll rate	± 8 deg/sec
37	Static pressure, PX-5	0 to 15 psia
38	Static pressure, PX-6	0 to 15 psia
39	Lox pump inlet pressure	0 to 100 psia
40	Main fuel tank top pressure	0 to 100 psia
41	Gas generator lox injector pressure	0 to 800 psia
42	Main lox tank top pressure	0 to 100 psia
43	Lox pump inlet temperature	-275 to -300 deg F
44	Synchronization signal	0 to 5 volts
45	Synchronization signal	0 to 5 volts

[redacted]

[redacted]

LMSC 445925-D
Tab 45
1159/354

BOOSTER 354 TELEMETRY INSTRUMENTATION SCHEDULE

PDM Channel Assignments, Kit No. 2

Channel	Function	Range
1	5-volt absolute	0 to 5 volts
2	Instrumentation ground	0 to 5 volts
~~3, 18 & 33~~	~~Solid motor chamber pressure, low range, solid motor No. 1~~	Not assigned ~~0 to 100 psia~~
4	Static pressure, PX-7	0 to 15 psia
5	Static pressure, PX-8	0 to 15 psia
6	Static pressure, PX-9	0 to 15 psia
7	Static pressure, PX-10	0 to 15 psia
8	Static pressure, PX-11	0 to 15 psia
9	Static pressure, PX-12	0 to 15 psia
10	Static pressure, PX-13	0 to 15 psia
11	Static pressure, PX-14	0 to 15 psia
12	Static pressure, PX-15	0 to 15 psia
13	Static pressure, PX-16	0 to 15 psia
14	Static pressure, PX-17	0 to 15 psia
15	Static pressure, PX-18	0 to 15 psia
16	Static pressure, PX-19	0 to 15 psia
17	Nozzle closure heat rate, solid motor No. 2	0 to 30 *
~~3, 18 & 33~~	~~Solid motor chamber pressure, low range, solid motor No. 1~~	Not assigned ~~0 to 100 psia~~
19	Temperature bridge voltage (4.5 v)	0 to 5 volts
20	Temperature sensor, T-1	32 to 800 deg F
21	Temperature sensor, T-2	32 to 800 deg F
22	Temperature sensor, T-3	32 to 800 deg F
23	Temperature sensor, T-4	32 to 800 deg F
24	Temperature sensor, T-5	32 to 800 deg F
25	Temperature sensor, T-6	32 to 800 deg F
26	Temperature sensor, T-7	32 to 800 deg F
27	Temperature sensor, T-8	32 to 800 deg F
28	Temperature sensor, T-9	32 to 800 deg F
29	Temperature sensor, T-10	32 to 800 deg F
30	Temperature sensor, T-11	32 to 800 deg F
31	Temperature sensor, T-12	32 to 800 deg F
32	Temperature sensor, T-13	32 to 800 deg F
~~3, 18 & 33~~	~~Solid motor chamber pressure, low range, solid motor No. 1~~	Not assigned ~~0 to 100 psia~~
34	Temperature sensor, T-14	32 5o 800 deg F
35	Nozzle throat heat rate	0 to 30 *
36	Temperature bridge voltage (0.5 v)	0 to 5 volts
37	5-volt potentiometer excitation	0 to 5 volts
38	Radiometer q, R-1	0 to 50 *
39	Radiometer q, R-2	0 to 50 *
40	Radiometer q, R-3	0 to 50 *
41	Heating rate sensor, T-1	0 to 30 *
42	Heating rate sensor, T-2	0 to 30 *
43	Heating rate sensor, T-3	0 to 30 *
44	Synchronization s [redacted]	0 to 5 volts
45	Synchronization s [redacted]	0 to 5 volts

foot per sec [redacted]

[redacted]

[redacted]

Copy 3B 17

LMSC 445925-D
TAB 46
1164/360
26 February 1963

TAB 46

PROGRAM 162 LAUNCH TEST DIRECTIVE
(U)
for
PROGRAM 162 VEHICLE 1164/360
(U)

Contract AF 04 (695)-233

APPROVED:

F. E. Gaiser

F. E. Gaiser, Manager
Launch Systems Engineering, VAFB
Lockheed Missiles & Space Company
Senior LMSC Member
Launch Test Working Group

APPROVED:

S. M. Abeles
Douglas Project Engineer, VAFB
Douglas Aircraft Company
Senior DAC Member
Launch Test Working Group

APPROVED:

D. K. Briggs,
Director
Vandenberg Field Station
Bell Telephone Laboratories, Incorporated

APPROVED:

Lucius A. Perry

L. A. Perry, Jr., Colonel, USAF
Deputy Commander Space Launches
6595th Aerospace Test Wing (AFSC)

LOCKHEED AIRCRAFT CORPORATION
Missiles and Space Company
Vandenberg Air Force Base, California

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63-0917

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CY ______ OF ______ CYS

CONTENTS TAB 46

		Page
1.	Introduction	46-1
2.	Flight Test Information	46-2
3.	Flight Plan and Timed Events	46-3
4.	S-01A Landline Instrumentation Schedule	46-4
5.	Booster Landline Instrumentation Schedule	46-6
6.	Booster Telemetry Instrumentation Schedule	46-8
7.	Booster Magnetic Tape Track Assignments	46-12
8.	Documentary Detailed Test Requirements	46-13
9.	Camera Locations Pad 4	46-14
10.	RF Monitor List	46-15

INTRODUCTION

This Tab applies to Program 162 Launch Test Directive, LMSC 445925-D, and should be inserted in the back of that publication. It covers launch preparation and launch of S-01A satellite vehicle 1164 mated to SLV-2A booster 360. The vehicle is scheduled to launch from VAFB Complex 75-3, Pad 4 which has been modified accordingly.

This will be the second satellite launched with an SLV-2A booster. The solid motors attached to the booster require special pad safety precautions and also necessitate modified optical coverage of the vehicle in flight. The latter is covered in the basic LTD.

This will be the first launch with the BTL missile-borne guidance system installed in the S-01A satellite vehicle. Commands to the booster will be routed through the SLV-2A/S-01A BTL interface plug. The guidance phase will continue after separation and will terminate at about T + 460 seconds. The basic LTD is under revision to cover this topic more thoroughly.

Recovery of one of the three solid booster motors is desired, if it is floating.

The Pad 4 camera location diagram, page 46-14, should be used with optical data requirements in lieu of the figure contained in the basic LTD. Also, Documentary Photographic Requirements for Pad 4 on Page 46-13 should be used instead of those for Pad 5 appearing in the basic LTD. A future change to the basic LTD will cover all pads.

Surface Wind Limitations, SLV-2A/S-01A Vehicles

The following surface wind restrictions supersedes those set forth in paragraph 7.8.3 of the basic LTD: A launch will not be attempted when the wind velocity at the launch site exceeds 40 knots from any direction, or when the wind velocity exceeds 30 knots from the critical sector. The critical wind sector for the launch emplacement is:

Launch Pad	Critical Wind Sector
4	000 to 135 degrees

Surface wind will restrict all activity at the launch pad requiring the vehicle to be erected. The standard SLV-2A/S-01A may not be erected when surface winds, including gusts, exceed the following limits (in knots):

Configuration	Toppling Condition	Launcher Pins In
Vehicle empty without solid motors	16	46
Vehicle empty with solid motors attached	32	46
S-01A only loaded with solid motors attached	37	41
Vehicle loaded with solid motors attached	37	37
Vehicle loaded and pressurized with solid motors attached	63	64

[redacted]

LMSC 445925-D
TAB 46
1164/360

Flight Test Information

Booster	SLV-2A 360
Satellite Vehicle	S-01A 1164
Launch Pad	Complex 75-3 Pad 4
Pad Azimuth	181.5 deg
Launch Azimuth	175 deg
Perigee	90 nm
Orbit Inclination Angle	75 deg
Period	90.7 min
Gross Liftoff Weight (1)	153,021 lbs
Scheduled Launch Date	14 March 1963

(1) Best information available as of 2/22/63. Payload changes under consideration may vary this weight.

[redacted]

FLIGHT PLAN BOOSTER 360

The flight controller program for the primary mission is:

	Programmer Rates (deg/sec)		
Time (Sec)	**Roll**	**Pitch**	**Yaw**
0 to 2.8446	0	0	0
2.8446 to 3.155	+6.000	0	0
3.155 to 4	0	0	0
4 to 9.667	0	-2.828	0
9.667 to 10	0	0	0
10 to 54.667	0	-0.707	0
54.667 to 55	0	0	0
55 to 79.667	0	-0.525	0
79.667 to 80	0	0	0
80 to 89.667	0	-0.218	-0.862
89.667 to 90	0	0	0
90 to 90.7001	+6.000	-0.218	0
90.7001 to 91.0331	0	0	0
91.0331 to 170	0	-0.218	0

TIMED EVENTS BOOSTER 360

The control system will be programmed for the following plan of events:

Time (Sec)	**Event**
T + 55	Enable separation circuitry (solid motors)
T + 70	Solid motor separation Roll gain change
T + 80	Solid motor separation backup signal Guidance enable
T + 102	Enable vernier engine yaw movement Main engine gain change
T + 138	MECO enable

[redacted]

[redacted]

LMSC 445925-D
TAB 46
1164/360

LANDLINE INSTRUMENTATION SCHEDULE

S-01A VEHICLE 1164

RECORDER NO. 1

Channel	Function
1	Guidance Gas Fill Line Drop
2	He High Press. Fill Line Drop
3	Fuel Fill Line Drop
4	Acid Fill Line Drop
5	Air Cond. Line Drop
6	P/L Blanket Drop
7	
8	Lift-Off

RECORDER NO. 2

1	AP18
2	AP12
3	AP 8
4	AP10
5	AP 2
6	AP 9
7	AP 3
8	Lift-Off

RECORDER NO. 3

1	He Sphere Temp.
2	He Sphere Temp.
3	N_2 Sphere Temp.
4	N_2 Sphere Temp.
5	
6	He Line Press.
7	Guidance Gas Line Press.
8	Lift-Off

RECORDER NO. 4

1	Fuel Vent Line Press
2	Oxid Vent Line Press.
3	Oxid Vent Umbilical Connect
4	Fuel Vent Umbilical Connect
5	
6	[redacted]
7	[redacted]
8	[redacted]

LANDLINE INSTRUMENTATION SCHEDULE (Cont'd)

S-01A VEHICLE 1164

RECORDER NO. 5

Channel	Function
1	+ 28VDC Reg.
2	-28 VDC Reg.
3	Batt. Curr.
4	
5	
6	
7	P/L Skin Temp
8	Lift-Off

RECORDER NO. 6

Channel	Function
1	Gas Valve 1
2	Gas Valve 2
3	Gas Valve 3
4	Gas Valve 4
5	Gas Valve 5
6	Gas Valve 6
7	Yaw Gyro Temp.
8	Roll Gyro Temp.

[redacted]

BOOSTER LANDLINE INSTRUMENTATION

GROUND MONITOR SYSTEM

FUNCTION	RANGE	NOMINAL VALUES
Main liquid oxygen tank pressure	0-50 psig	33 psig
Main fuel tank pressure	0-50 psig	28 psig
Nitrogen storage tank bottle pressure	0-8,000 psig	6,000 psig
High-pressure missile bottle pressure	0-5,000 psig	3,000 psig
Vernier fuel start tank pressure	0-1,000 psig	646 psig
Vernier liquid oxygen start tank pressure	0-1,000 psig	646 psig
Engine regulator discharge pressure	0-800 psig	646 psig
Liquid oxygen storage tank pressure	0-150 psig	71 psig
Fuel storage tank pressure	0-150 psig	53 psig
Control manifold pressure	0-200 psig	135 psig
Transducer 5-volt supply	0-10 volts	5 volts
Hydraulic return pressure	0-200 psig	80 psig

[redacted]

BOOSTER LANDLINE INSTRUMENTATION

EVENTS RECORDER CHANNEL ASSIGNMENTS

CHANNEL	EVENT
1	Base timing
2	Power on (sequence initiation)
3	Phase completion (resets automatically)
4	Flight controller on
5	Fuel storage tank vent valve closed
6	Control manifold pressurizing valve open
7	Missile bottles pressurizing valve open
8	Lox storage tank vent valve closed
9	Lox storage tank pressurizing valve open
10	Hydraulics normal
11	Engine centered
12	Engine off center
13	Engine recentered
14	Launcher hydraulics normal
15	Missile bottles pressurized
16	Engine purge on
17	Main fuel tank vent valve open
18	Fuel storage tank pressurizing valve open
19	Fuel fine load valve open
20	Lox fine load valve open
21	Lox rapid load valve open
22	Fuel rapid load valve open
23	Main lox tank vent valve open
24	97% fuel
25	100% fuel
26	Main fuel tank pre-pressurizing valve open
27	BTL guidance on internal power
28	95% lox
29	Inverter on
30	Inverter on internal
31	Flight controller on internal
32	Booster on internal power
33	Launcher clear to fire
34	Lox transfer resume
35	Main lox tank vent valve boost close
36	Main lox tank pre-pressurizing valve open
37	99% lox
38	100% lox
39	Main propellant tanks pressurized
40	Propellant transfer complete
41	Engine start
42	Liftoff
43	Technical hold imposed
44	Malfunction
45	Propellant hold over-ride
46	Flight con[redacted]ics over-ride
47	Phase V ho[redacted]
48	"Proceeding[redacted]al"
49	Liftoff sig[redacted]na
50	Inter[redacted]

[redacted]

BOOSTER TELEMETRY INSTRUMENTATION SCHEDULE

FM/FM CHANNELS, KIT NO. 1

FM/FM CHANNEL	CENTER FREQUENCY	FUNCTION	RANGE
7	2.3	Solid motor chamber pressure, low range solid motor No. 3	0 to 100 psia
8	3.0	Vernier engine No. 2 chamber pressure	0 to 500 psia
9	3.9	Not Assigned	
10	5.4	Sequence No. 1: fuel and lox float switches, MECO, VECO	0 to 5 volts
11	7.35	Main engine chamber pressure, close-coupled transducer	0 to 800 psia
12	10.5	Not Assigned	
13	14.5	Vibration, pitch axis, low level, forward thrust structure, solid motor	± 3 g
A	22.0	Solid motor chamber pressure, high range, solid motor No. 3	0 to 800 psia
C	40.0	Vibration, high level, gimbal block area, longitudinal axis	0 to 1,200 cps
E	70.0	Subcommutated to 45 PDM channels	See Kit 1, Pg. 46-9

FM/FM CHANNELS, KIT NO. 2

FM/FM CHANNEL	CENTER FREQUENCY	FUNCTION	RANGE
7	2.3	Sequence No. 3: solid motor removals, No. 1, No. 2, No. 3	0 to 5 volts
8	3.0	Sequence No. 2: ignition switches 1 & 2 pickup, separation signals (primary & backup)	0 to 5 volts
9	3.9	Vehicle axial acceleration	0 to 8 g
10	5.4	Solid motor chamber pressure, low range, solid motor No. 2	0 to 100 psia
11	7.35	Solid motor chamber pressure, high range, solid motor No. 1	0 to 800 psia
12	10.5	Vibration, low level, engine gimbal block longitudinal axis	± 12 g
13	14.5	Vibration, low level, aft thrust structure, solid motor, pitch axis	± 3 g
A	22.0	Solid motor chamber pressure, high range, solid motor No. 2	0 to 800 psia
C	40.0	Vibration, pitch axis, high level, junction box between thrust beams	0 to 1,200 cps
E	70.0	Subcommutated to 45 PDM channels	See Kit 2, Pg. 46-10

* BTU per square foot per secon[redacted]

[redacted]

LMSC 445925-D
TAB 46
1164/360

BOOSTER TELEMETRY INSTRUMENTATION SCHEDULE

PDM CHANNEL ASSIGNMENTS, KIT NO. 1

CHANNEL	FUNCTION	RANGE
1	5-volt absolute	0 to 5 volts
2	Instrumentation ground	0 to 5 volts
3	Main engine pitch position	± 2 degrees
4	Main engine yaw position	± 2 degrees
5	Vernier engine No. 1 pitch position	± 45 degrees
6	Vernier engine No. 1 yaw position	-8 to -28 degrees
7	Vernier engine No. 2 pitch position	± 45 degrees
8	Vernier engine No. 2 yaw position	+8 to +28 degrees
9	Pitch attitude error	± 4 degrees
10	Yaw attitude error	± 4 degrees
11	Roll attitude error	± 6 degrees
12 & 34	Pitch rate	± 4 deg/sec
13 & 35	Yaw rate	± 3.5 deg/sec
14 & 36	Roll rate	± 8 deg/sec
15	Pitch command	± 4 deg/sec
16	Yaw command	± 3.5 deg/sec
17	Actuator potentiometer positive voltage	0 to 30 volts
18	Actuator potentiometer negative voltage	-13 to -30 volts
19	400-cps voltage, phase A control inverter	110 to 120 volts
20	5-volt potentiometer excitation	0 to 5 volts
21	Main engine chamber pressure**	0 to 800 psia
22	Not assigned	---
23	Missile battery voltage	0 to 32 volts
24	Telemetry battery voltage	0 to 32 volts
25	Hydraulic supply pressure	0 to 4,000 psia
26	Hydraulic return pressure	0 to 200 psia
27	Turbopump speed	0 to 8,000 rpm
28	Turbine inlet temperature	0 to 1,500 deg F
29	Nozzle closure heat rate, solid motor No. 2	0 to 50 BTU*
30	Static pressure, PX-1	0 to 15 psia
31	Static pressure, PX-2	0 to 15 psia
32	Static pressure, PX-3	0 to 15 psia
33	Static pressure, PX-4	0 to 15 psia
12 & 34	Pitch rate	± 4 deg/sec
13 & 35	Yaw rate	± 3.5 deg/sec
14 & 36	Roll rate	± 8 deg/sec
37	Static pressure, PX-5	0 to 15 psia
38	Static pressure, PX-6	0 to 15 psia
39	Nozzle throat heat rate, solid motor No. 2	0 to 50 BTU*
40	Main fuel tank top pressure	0 to 100 psia
41	Gas generator lox injector pressure	0 to 800 psia
42	Main lox tank top pressure	0 to 100 psia
43	Lox pump inlet temperature	-275 to -300 deg F
44	Synchronization signal	0 to 5 volts
45	Synchronization signal	0 to 5 volts

* BTU per square foot per secon [redacted]
** Cross-strapped with FM channel [redacted]

[redacted]

LMSC 445925-D
TAB 46
1164/360

BOOSTER TELEMETRY INSTRUMENTATION SCHEDULE

PDM CHANNEL ASSIGNMENTS, KIT NO. 2

CHANNEL	FUNCTION	RANGE
1	5-volt absolute	0 to 5 volts
2	Instrumentation ground	0 to 5 volts
3	Solid motor chamber pressure, low range, solid motor No. 1	0 to 100 psia
4	Static pressure, PX-7	0 to 15 psia
5	Static pressure, PX-8	0 to 15 psia
6	Static pressure, PX-9	0 to 15 psia
7	Static pressure, PX-10	0 to 15 psia
8	Static pressure, PX-11	0 to 15 psia
9	Static pressure, PX-12	0 to 15 psia
10	Static pressure, PX-13	0 to 15 psia
11	Static pressure, PX-14	0 to 15 psia
12	Static pressure, PX-15	0 to 15 psia
13	Static pressure, PX-16	0 to 15 psia
14	Static pressure, PX-17	0 to 15 psia
15	Static pressure, PX-18	0 to 15 psia
16	Static pressure, PX-19	0 to 15 psia
17	Static pressure, PX-20	0 to 15 psia
18	Solid motor chamber pressure, low range, solid motor No. 1	0 to 100 psia
19	Temperature bridge voltage (4.5 volts)	0 to 5 volts
20	Temperature sensor T-1	0 to 800 deg F
21	Temperature sensor T-2	0 to 800 deg F
22	Temperature sensor T-3	0 to 800 deg F
23	Temperature sensor T-4	0 to 800 deg F
24	Temperature sensor T-5	0 to 800 deg F
25	Temperature sensor T-6	0 to 800 deg F
26	Heating rate sensor T-4	0 to 30 BTU*
27	Temperature sensor T-8	0 to 800 deg F
28	Temperature sensor T-9	0 to 800 deg F
29	Temperature sensor T-10	0 to 800 deg F
30	Temperature sensor T-11	0 to 800 deg F
31	Temperature sensor T-12	0 to 800 deg F
32	Heating rate sensor T-5	0 to 30 BTU*
33	Solid motor chamber pressure, low range, solid motor No. 1	0 to 100 psia
34	Temperature sensor T-14	0 to 800 deg F
35	Temperature sensor T-15	0 to 800 deg F
36	Temperature bridge voltage (0.5 volt)	0 to 5 volts
37	5-volt potentiometer excitation	0 to 5 volts
38	Radiometer q R-1	0 to 50 BTU*
39	Radiometer q R-2	0 to 50 BTU*
40	Radiometer q R-3	0 to 50 BTU*
41	Heating rate sensor T-1	0 to 30 BTU*
42	Heating rate sensor T-2	0 to 30 BTU*
43	Heating rate sensor T-3	0 to 30 BTU*
44	Synchronization signal	0 to 5 volts
45	Synchronization signal [redacted]	0 to 5 volts

* BTU per square foot per secon[redacted]

BOOSTER TELEMETRY INSTRUMENTATION SCHEDULE

CHANNEL ASSIGNMENTS, KIT NO. 3

FM/FM CHANNEL	CENTER FREQUENCY	FUNCTION	RANGE
9	3.9	Lox pump outlet pressure	0 to 1,000 psia
10	5.4	Fuel duct outlet pressure	0 to 1,000 psia
11	7.35	Lox pump inlet pressure	0 to 100 psia
12	10.5	Fuel pump inlet pressure	0 to 200 psia
13	14.5	Yaw acceleration, engine relay box	± 10 g
A	22.0	Pitch acceleration, engine relay box	± 10 g
C	40.0	Longitudinal acceleration, engine relay box	-5 to +20 g
E	70.0	Axial acceleration, lox dome	± 25 g

BOOSTER MAGNETIC TAPE TRACK ASSIGNMENTS

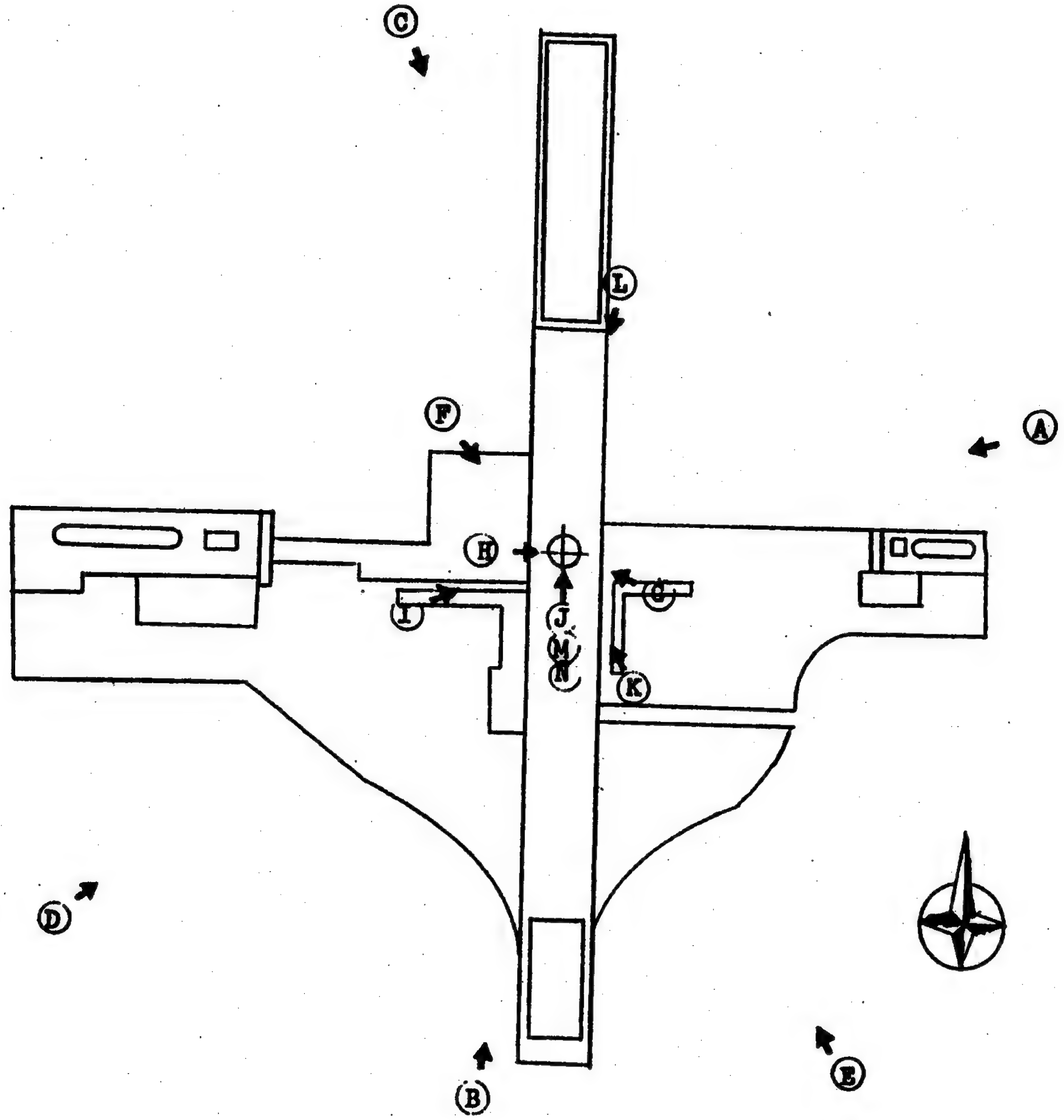
RECORDER	TRACK	DIRECT RECORDING ASSIGNMENT (60 IPS)
1	1	100-pps timing, AMR format D-5, modulated on 1 kc
1	2	SLV-2A telemetry link No. 1 primary, 100-kc wow and flutter (Tango 48)
1	3	SLV-2A telemetry link No. 2 primary, 100-kc wow and flutter (Tango 61)
1	4	60-cps, 17-kc speedlock; AGC No. 1 (5.4 kc); AGC No. 2 (7.35 kc); AGC No. 3 (10.5 kc); AGC No. 4 (14.5 kc); liftoff signal (22 kc); voice (30 kc)
1	5	SLV-2A telemetry link No. 3 primary, 100-kc wow and flutter (Tango 90)
1	6	SO-1 telemetry link No. 2 primary, 100-kc wow and flutter
1	7	1-pps timing, AMR format B-1, modulated on 1 kc
2	1	100-pps timing, AMR format D-5, modulated on 1 kc
2	2	SLV-2A telemetry link No. 1 secondary, 100-kc wow and flutter
2	3	SLV-2A telemetry link No. 2 secondary, 100-kc wow and flutter
2	4	60-cps, 17-kc speedlock; AGC No. 1 (5.4 kc); AGC No. 2 (7.35 kc); AGC No. 3 (10.5 kc); AGC No. 4 (14.5 kc); liftoff signal (22 kc); voice (30 kc)
2	5	SLV-2A telemetry link No. 3 secondary, 100-kc wow and flutter
2	6	SO-1 telemetry link No. 2 secondary, 100-kc wow and flutter
2	7	1-pps timing, AMR format B-1, modulated on 1 kc

[redacted]

DOCUMENTARY
DETAILED TEST REQUIREMENTS
COMPLEX 75-3 PAD 4

ITEM NO.	CAMERA POSITION	FILM SIZE	EMULSION	DURATION T- to	DURATION T+	FPS	IMAGE TO FRAME RATIO	OPTIMUM EX-POSURE AREA	COVERAGE
12.1	TS-6A	16mm	ECO	20S	LOV	24	Entire Vehicle to Fill 4/5 Fr. at Liftoff	Missile	Tracking
12.2	TS-8	16mm	ECO	20S	LOV	24	Entire Vehicle to Fill 4/5 Fr. at Liftoff	Missile	Tracking
12.3	LE-6	16mm	ECO	20S	LOV	24	Entire Vehicle to Fill 4/5 Fr. at Liftoff	Missile	Tracking
12.4	TS-6A	70mm	Anscochrome	5S	Runout	10	Entire Vehicle to Fill 4/5 Fr. at Liftoff	Missile	Tracking
12.5	B	70mm	Anscochrome	5S	Runout	10	Entire Vehicle to Fill 3/4 Frame at Liftoff	Missile	Pictorial Liftoff
12.6	B	4x5	Anscochrome	N/A	N/A		Vehicle Fills 2/3 Frame	Missile	Pictorial Liftoff
12.7	A	4x5	Anscochrome	N/A	N/A		Vehicle Fills 2/3 Frame	Missile	Pictorial Liftoff
12.8	E	4x5	B&W	N/A	N/A		Vehicle Fills 2/3 Frame	Missile	Pictorial Liftoff

CAMERA LOCATIONS, 75-3 PAD 4



[redacted]

[redacted]

R. F. [redacted]

LMSC 445925-D
TAB 46
1164/360

SATELLITE VEHICLE 1164

EQUIPMENT	CODE
Vehicle Link I	T-60
Vehicle Link II	T-59
Vehicle Link IV	T-28
Acquisition Beacon	T-25
Capsule TLM	T-59
Capsule Beacon and Drop Marker	T-65
VERLORT Receiver	S-30D
VERLORT Transmitter	S-68P
Auxiliary Command System	V-89
Special Projects Command	V-95

BOOSTER 360

TLM Kit 1	T-48
TLM Kit 2	T-61
TLM Kit 3	T-90

[redacted]

LMSC 445925-D
TAB 47
1160/376
7 March 1963

TAB 47

LAUNCH TEST DIRECTIVE
FOR VEHICLE 1160/376
CONTRACT AF 04 (695)-233

Approved:

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Missiles and Space Company
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Distribution - LMSC 223616-3

63-1002

[redacted] 6595TH TW
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TAB 47

CONTENTS

		PAGE
1.	Introduction	47-1
2.	Flight Test Information	47-2
3.	Booster Flight Plan	47-3
4.	RF Monitor List	47-4
5.	Satellite Vehicle Landline Instrumentation Schedule	47-5
6.	Booster Landline Instrumentation Schedule	47-6
7.	Booster Telemetry Instrumentation Schedule	47-7
8.	Booster Magnetic Tape Track Assignments	47-8
9.	Weather Conditions	47-9
10.	Optical Coverage	47-10
11.	Booster Configuration	47-11
12.	Integrated Milestone Countdown Chart	47-13

[redacted]

INTRODUCTION

This tab covers the launch of SLV-2 booster 376 mated to S-01A satellite vehicle 1160. It is to be used with Program 162 Launch Test Directive, LMSC 445925-D, and should be inserted in the back of that publication.

Since the basic LTD is primarily devoted to SLV-2A booster launches, portions of the following items will differ for this launch:

Booster configuration	(4.2.1)
Booster pad checks	(5.7)
Countdown chart	(Figure 6-2)
Optical coverage	
Weather conditions	(7.8)

References to solid motor fit checks in paragraph 4.7 of the basic LTD should be disregarded. Information to clarify other items is set forth on separate pages in this tab as listed in the index.

The BTL guidance system for this launch will be installed in the booster.

[redacted]

FLIGHT TEST INFORMATION

Booster	SLV-2 serial 376
Satellite Vehicle	S-01A serial 1160
Launch pad	75-3, Pad 5
Pad azimuth	218.4 deg
Launch azimuth	172 deg
Primary flight mission (1):	
Perigee	113 nm
Orbit inclination angle	75 deg
Period	90.7 min
Alternate flight mission (2):	
Perigee	113 nm
Orbit inclination	81.8 deg
Period	91.0 min
Scheduled launch date	22 February 1963
Launch window	To be announced
Gross lift-off weight	123,706 lbs. (3)

(1) Reference LMSC A094529-4.

This mission will be used unless further notice is given.

(2) Reference LMSC A094529-7.

(3) Weight based on information available on 14 February 1963. May vary slightly at launch.

[redacted]

BOOSTER 376

FLIGHT PLAN

Booster 376 will lift off with the payload with a sea-level thrust of 172,000 pounds (± 3 per cent). The flight controller in booster 376 will be programmed for a 113-nm/75-deg mission at the following rates and times:

Time (sec)	Programmer Rates (deg/sec) Roll	 Pitch	 Yaw
0 to 2	0	0	0
2 to 15	+3.577	0	0
15 to 17	0	0	0
17 to 34.667	0	-0.932	0
34.667 to 35	0	0	0
35 to 69.667	0	-0.700	0
69.667 to 70	0	0	0
70 to 89.667	0	-0.592	0
89.667 to 90	0	0	0
90 to 130	0	-0.291	0
130 to 131	0	0	0
131 to 132.3405	+3.577	0	0
132.3405 to burnout	0	0	0

T+147 (±5) The booster will execute main engine cutoff (MECO ; velocity at MECO will not be less than 500 ft/sec below the nominal established for the mission.

MECO + 9 (± 0.9) The booster will execute vernier engine cutoff (VECO). Pitch flight path angle at VECO will be within 4 degrees of the nominal.

[redacted]

R. F. MONITOR LIST

SATELLITE VEHICLE

EQUIPMENT	CODE
Vehicle Link I	T-60
Vehicle Link II	T-59
Acquisition Beacon	T-25
Capsule TLM	T-59
Capsule Beacon and Drop Marker	T-65
VERLORT Receiver	S-30 D
VERLORT Transmitter	S-68 P
Auxiliary Command System	V-89
Special Projects Command	V-95

[redacted]

SATELLITE VEHICLE LANDLINE INSTRUMENTATION SCHEDULE -- VEHICLE 1160

RECORDER D1

CH.	
1	DAC Liftoff
2	Time Pulse
3	Roll Gyro Out
4	Open
5	Open
6	Gas Valves 1-6

RECORDER 1

CH.	
1	Yaw Gyro Temp
2	Roll Gyro Temp
3	Accelerometer Temp
4	Oven Temp
5	Open
6	Open
7	Open
8	Open

RECORDER 3

CH.	
1	Helium Line Press.
2	Guidance Gas Line Press.
3	Open
4	UDMH Sniffer
5	IRFNA Sniffer
6	Open
7	Open
8	Open

CEC RECORDER (36 CHANNEL)

CH.	
7	Battery Current
12	115 V, 400 CPS, ø AB
14	Battery Voltage
16	-28 VDC Reg
20	+28 VDC Reg
21	115 V, 400 CPS, ø BC
22	+28 VDC, Ext Pwr Supply
26	115 V, 400 CPS, ø AC

RECORDER D2

CH.	
1	Pitch Servo
2	Yaw Servo
3	Pitch Actuator
4	Yaw Actuator
5	Vel No. Readout
6	Counterwarning

RECORDER 2

CH.	
1	Gas Valve 1
2	Gas Valve 2
3	Gas Valve 3
4	Gas Valve 4
5	Gas Valve 5
6	Gas Valve 6
7	Open
8	P/L Skin Temp

RECORDER 4

CH.	
1	Open
2	Open
3	N2 Sphere Temp, High Scale
4	N2 Sphere Temp, Low Scale
5	He Sphere Temp, Low Scale
6	He Sphere Temp, High Scale
7	Ox. Vent Press.
8	Fuel Vent Press.

RECORDER 13 (EVENTS)

CH.	
26	Fuel Vent
27	Ox. Vent Umb Conn
28	Umbilical Drop
29	DAC Liftoff
30	Time Pulse

[redacted]

BOOSTER LANDLINE INSTRUMENTATION SCHEDULE

Function	Range	Nominal Values
Main liquid oxygen tank pressure	0-50 psig	33 psig
Main fuel tank pressure	0-50 psig	28 psig
Nitrogen storage tank bottle pressure	0-8,000 psig	6,000 psig
High-pressure missile bottle pressure	0-5,000 psig	3,000 psig
Vernier fuel start tank pressure	0-1,000 psig	646 psig
Vernier liquid oxygen start tank pressure	0-1,000 psig	646 psig
Engine regulator discharge pressure	0-800 psig	646 psig
Liquid oxygen storage tank pressure	0-150 psig	71 psig
Fuel storage tank pressure	0-150 psig	53 psig
Control manifold pressure	0-200 psig	135 psig
Transducer 5-volt supply	0-10 volts	5 volts
Hydraulic return pressure	0-200 psig	80 psig

[redacted]

LMSC 445925-D
TAB 47
1160/376

BOOSTER

CHANNEL ASSIGNMENTS, IN-FLIGHT TELEMETRY (PDM)

FM/FM Channel	Center Frequency	Function	Range
8	3.0	Vernier engine No. 2 chamber pressure	0 to 500 psia
9	3.9	Combined BTL commands	0 to 5 volts
10	5.4	Main engine chamber pressure	0 to 800 psia
11	7.35	Sequence No. 1: fuel & lox float switches, MECO, VECO	0 to 5 volts
12	10.5	Magnetron current (BTL)	0 to 100%
E	70.0	PDM/FM/FM	See below

PDM/FM Channel	Function	Range
1	5-volt absolute	0 to 5 volts
2	Instrumentation ground	0 to 5 volts
3	Main engine pitch position	± 2 degrees
4	Main engine yaw position	± 2 degrees
5	Vernier engine No. 1 pitch position	± 20 degrees
6	Vernier engine No. 1 yaw position	0 to -20 deg
7	Vernier engine No. 2 pitch position	± 20 degrees
8	Vernier engine No. 2 yaw position	0 to +20 deg
9 & 31	Pitch attitude error	± 4 degrees
10 & 32	Yaw attitude error	± 4 degrees
11 & 33	Roll attitude error	± 4 degrees
12 & 34	Pitch rate	± 2 deg/sec
13 & 35	Yaw rate	± 2 deg/sec
14 & 36	Roll rate	± 8 deg/sec
15 & 37	Pitch command	± 3.5 deg/sec
16 & 38	Yaw command	± 3.5 deg/sec
17	Actuator potentiometer positive	0 to 30 volts
18	Actuator potentiometer negative	-13 to -30 volts
19	400-cps voltage, phase A (control inverter)	110 to 120 volts
20	5-volt potentiometer excitation	0 to 5 volts
21	Automatic gain control (BTL)	0 to -90 dbm
22	Input supply voltage (BTL)	20 to 36 volts
23	Missile battery voltage	0 to 32 volts
24	Telemetry battery voltage	0 to 32 volts
25	Hydraulic supply pressure	0 to 4,000 psia
26	Hydraulic return pressure	0 to 200 psia
27	Turbopump speed	0 to 8,000 rpm
28	Turbine inlet temperature	0 to 1,500 deg F
29	Fuel pump inlet pressure	0 to 200 psia
30	Spare	--
39	Lox pump inlet pressure	0 to 100 psia
40	Main fuel tank top pressure	0 to 100 psia
41	Gas generator lox injection pressure	0 to 800 psia
42	Main lox tank top pressu[redacted]	0 to 100 psia
43	Lox pump inlet temperatu[redacted]	-275 to -300 deg F
44	Framing signal	0 to 5 volts
45	Framing signal	0 to 5 volts

[redacted]

LMSC 445925-D
TAB 47
1160/376

MAGNETIC TAPE TRACK ASSIGNMENTS (PDM)

Track	Assignment	Type
1	Pulse-duration modulation (70 KC)	Pulse Record
2	Agena telemetry receiver No. 1; 100-KC wow & flutter	Direct
3	Thor telemetry receiver No. 2; 100-KC wow & flutter	Direct
4	60 CPS, 17-KC speedlock AGC No. 1)5.4 KC) AGC No. 2 (7.35 KC) AGC No. 3 (10.5 KC) Liftoff signal (22 KC) Voice (30 KC)	Direct
5	Thor telemetry receiver No. 3; 100-KC wow & flutter	Direct
6	100-PPS, 17-bit binary-coded timing, modulated on 1 KC	Direct
7	1-PPS, 17-bit binary-coded timing, modulated on 1 KC	Direct

Recording speed (all tracks): 60 IPS

[redacted]

WEATHER CONDITIONS

General Information

Since there are no solid motors, the weather restrictions for launch will be similar to those established for previous program 162 launches in lieu of those set forth in 7.8 of the basic LTD. The latter applies specifically to SLV-2A launches.

Visibility

Visibility requirements set forth in paragraph 7.8.1 of the basic LTD, which provides for optical coverage of booster in flight, should be disregarded. There are no visibility restrictions for this launch.

Wind Restrictions

Upper winds could become critical to a launch; severe wind shear should be reviewed for its effect on the vehicle trajectory. Other elements of upper weather will not normally affect a launch schedule.

Surface weather conditions, except for wind velocity, will not normally affect a launch schedule. The space system's maximum wind tolerance, 50 knots, is limited by the characteristics of the umbilical mast.

Before fueling and pressurization have been completed, the following surface wind restrictions (in knots) are applicable:

Fuel Load	Toppling Condition	Launcher Pins in	Pins in and Clamshells Closed
Vehicle empty	17	50	50
S-01A	27	50	50
Vehicle loaded	45	45	50

[redacted]

[redacted]

OPTICAL COVERAGE

Tables 8-1 and 8-2 in the basic LTD will be used for engineering sequential and documentary optics coverage respectively, with the exception that any reference to solid motors will be disregarded.

The LA-24 camera mount will be used for PMR photographic film requirements only. The two MOTU camera mounts set forth in Table 8-4 of the basic document are not required. The LA-24 coverage will be the vehicle instead of solid rockets for this launch.

BOOSTER CONFIGURATION

The basic LTD describes the SLV-2A booster. Since 376 is in the SLV-2 configuration, the description set forth herein will apply.

The design of the Douglas model DM-21 space booster has been adapted from the SM-75 intermediate range ballistic missile (IRBM). Design criteria are outlined in Performance Specification DS-2110A, dated 28 July 1960. The booster has been adapted to the DM-21 configuration from the DM-18 design in accordance with top drawing 5864277.

Airframe

The airframe consists of a cylindrical two-tank structure with a base diameter of 8 feet, and a forward conical section, the diameter of which tapers from 8 to 5.33 feet. The lox tank vent valve includes an elbow assembly to direct gas diffusion after MECO.

Propulsion System

The propulsion system consists of a gimballed Rocketdyne MB-3 Block II main engine and two vernier engines. The main engine will be rated at 170,000 pounds thrust (± 3 per cent) at sea level; vernier engines are rated at 1,000 pounds thrust (± 3 percent) at sea level. The propellant system also includes two main propellant tanks, two vernier engine start and solo tanks, a gas generator, a turbopump, propellant lines, and associated plumbing. Propellants will be liquid oxygen (LOX) and RJ-1 fuel (a kerosene-like hydrocarbon).

The main engine gimbals to provide pitch and yaw attitude control; the vernier engines provide roll stabilization.

BTL Command Guidance System

The BTL command guidance system consists of a precise, ground-based guidance radar, a Remington-Rang-Univac (RRU) Athena computer, and a series 400 missile-borne guidance equipment (MBGE) set.

Guidance radar determines the booster position as it tracks the missile. Position information is fed into the RRU computer, where it is continuously compared with the planned trajectory. From the comparison, the computer develops appropriate steering orders and discrete commands for guiding the vehicle on the required trajectory. The commands are fed from the computer to the ground radar, where they provide intelligence to the signal sent to the MBGE (in the booster). The MBGE processes the commands and forwards them to the flight controller. Telemeters will monitor response of the MBGE to the orders and commands which the ground guidance radar has sent.

Control System

The booster autopilot system is designed to stabilize and control the booster during powered flight. The major components of the system are the flight controller, the rate gy[redacted]'actuators, and the electrical power equipment.

Electrical Equipment

In addition to the flight controller and the three JRT-45 rate gyros, electrical equipment includes: a Bendix inverter (115 volts ac, three phase, 400 cps, 1.5 kilovolt-amperes), one Yardney 28.5-volt battery for missile control power, one Yardney 28.5-volt battery for guidance system power, two instrumentation batteries, and associated wiring. The inverter supplies ac power to the flight controller. The missile control battery is the primary power source for the engine relay box circuits, the flight controller, the rate gyros, the inverter and the BTL Ledex switch.

Hydro-Mechanical Equipment

Hydro-mechanical equipment provides the motive power for gimbaling the engines in response to commands from the flight controller. During pre-flight checkout and launch, a ground system brings hydraulic pressures up to in-flight levels, and allows checkout of the control system. In flight, hydraulic pressures are maintained by a pump powered by the gas generator.

In-Flight Hydraulics

The hydraulic pump and the hydraulic accessory unit, which includes a reservoir and accumulator system, maintain the in-flight hydraulic supply at a pressure of 3,000 psia for the demands of the engine actuators. Control equipment includes two main hydraulic actuator assemblies, two vernier pitch/roll actuator assemblies and two yaw actuator assemblies. The major components of the actuators are the servo valve, the cylinder assembly, and the position feedback potentiometer The servo valve regulates the rate of hydraulic fluid on the basis of electrical signals from the flight controller; thus the length of travel in the cylinders is regulated, and the cylinder travel determines engine positions.

Instrumentation Equipment

The standard booster instrumentation kit, model DM-2102-1, is a complete system for measuring and transmitting performance data for the booster. The measuring instruments--pressure transducers, thermocouples, a tachometer, position indicators, propellant float switch assemblies, and various resistance networks--are similar to those installed in previous configurations.

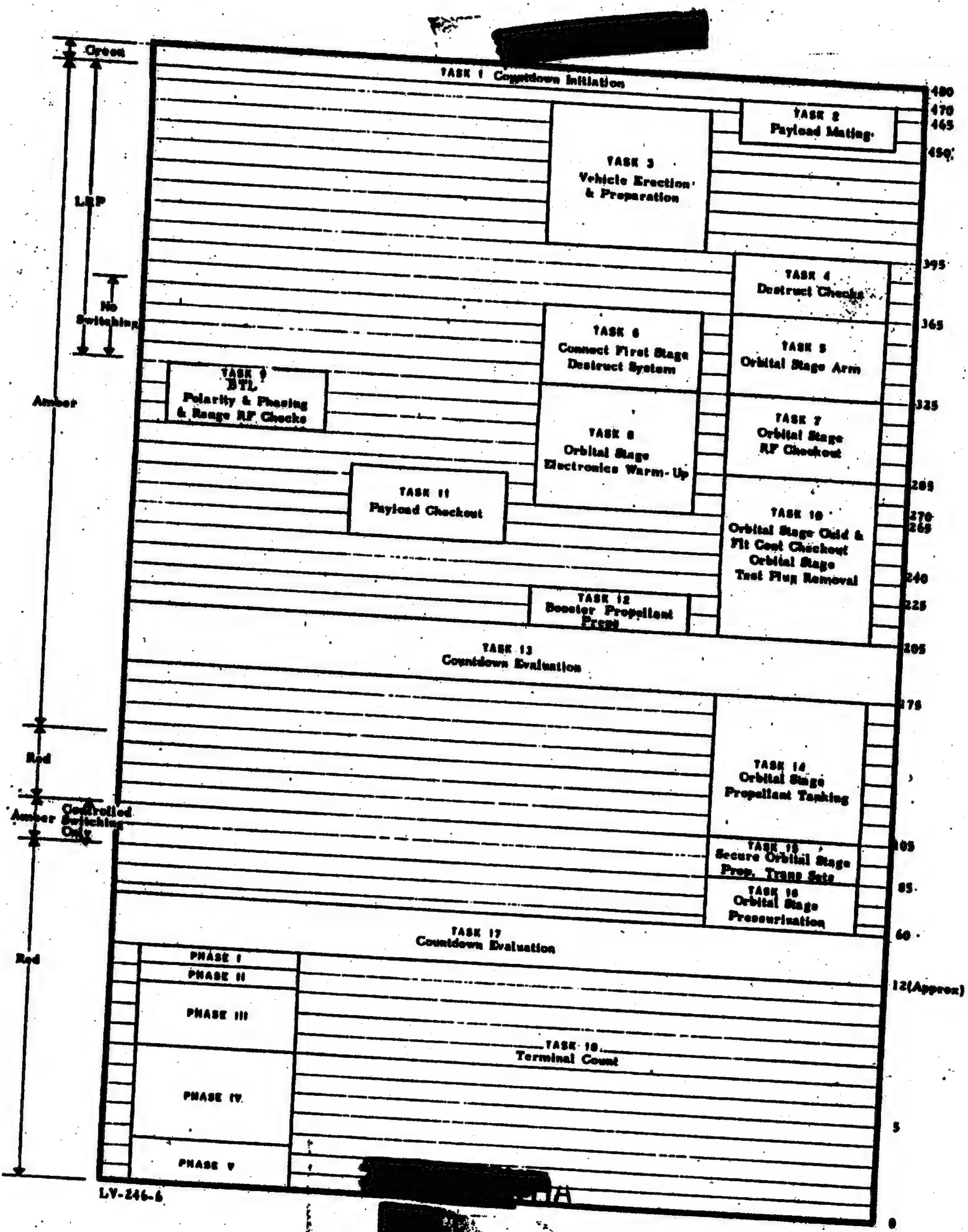
Destruct System

The range safety system, government-furnished equipment, is installed in duplicate in each booster. Each range safety kit includes one receiver, two antennas, a safety and arming (S&A) mechanism, and sufficient primacord (installed in the tunnel along both propellant tanks) to destroy the vehicle. Each kit is powered by an independent battery source. Before vehicle separation, a radio command from the Navy Range Safety Officer would activate the destruct system and destroy both stages of the vehicle. The system is described in detail in Douglas report SM-37963, DM-21 Range Safety System, dated November, 1960.

[redacted]

LMSC 445925-D
TAB 47
1160/376

[redacted]


Green
LRP
No Switching
Amber
Red
Amber
Controlled Switching Only
Red
TASK 1 Countdown Initiation
TASK 2 Payload Mating
TASK 3 Vehicle Erection & Preparation
TASK 4 Destruct Checks
TASK 5 Orbital Stage Arm
TASK 6 Connect First Stage Destruct System
TASK 7 Orbital Stage RF Checkout
TASK 8 Orbital Stage Electronics Warm-Up
TASK 9 BTL Polarity & Phasing & Range RF Checks
TASK 10 Orbital Stage Gold & Flt Cont Checkout Orbital Stage Test Plug Removal
TASK 11 Payload Checkout
TASK 12 Booster Propellant Props
TASK 13 Countdown Evaluation
TASK 14 Orbital Stage Propellant Tanking
TASK 15 Secure Orbital Stage Prop. Trans Sets
TASK 16 Orbital Stage Pressurization
TASK 17 Countdown Evaluation
PHASE I
PHASE II
PHASE III
PHASE IV
PHASE V
TASK 18 Terminal Count
480
470
465
450
395
365
325
285
270
265
240
225
205
175
105
85
60
12(Approx)
5
0
LV-246-6

[redacted]

ENTE[redacted]

LOCKHEED AIRCRAFT CORPORATION

MISSILES and SPACE DIVISION

[redacted]

LMSC 445925-D
TAB 48
1411/372
1 April 1963

TAB 48

PROGRAM 162 LAUNCH TEST DIRECTIVE
(U)
for
PROGRAM 162 VEHICLE 1411/372
(U)
Contract AF 04 (695)-233

APPROVED:	APPROVED:
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APPROVED:	APPROVED:
	Lucius A. Perry Jr.
D. K. Briggs, Director Vandenberg Field Station Bell Telephone Laboratories, Incorporated	L. A. Perry, Jr., Colonel, USAF Deputy Commander Space Launches 6595th Aerospace Test Wing (AFSC)

LOCKHEED AIRCRAFT CORPORATION
Missiles and Space Company
Vandenberg Air Force Base, California

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Distribution: LMSC 223616-4

6595TH TW 63-1342

[redacted] 4 OF 8 CYS

[redacted]

TAB 48

CONTENTS

		Page
1.	Introduction	48-1
2.	Flight Test Information	48-2
3.	Booster 372 Flight Plan	48-3
4.	RF Monitor List	48-4
5.	Satellite Vehicle Landline Instrumentation Schedule	48-5
6.	Booster Landline Instrumentation Schedule	48-6
7.	Booster Telemetry Schedule	48-7
8.	Booster Magnetic Tape Track Assignments	48-8
9.	Weather Conditions	48-9

6595TH TW 63-1342
CY OF CYS

[redacted]

INTRODUCTION

This tab covers the launch of S-01A Satellite Vehicle 1411 mated to SLV-2 Booster 372. It is to be used with Program 162 Launch Test Directive, LMSC 445925-D and should be inserted in the back of that publication.

Since the basic LTD is devoted primarily to SLV-2A/01A vehicles, portions of the following items will differ for this launch:

Vehicle Configuration	Section 4
Booster Pad Checks	Item 5.7
Countdown Chart	Figure 6.2
Optical Coverage	Section 8
Weather Conditions	Item 7.8

Reference to solid motor fit checks, 5.7 of the basic LTD, should be disregarded. Information on weather conditions is set forth on a separate page of this tab as listed in the index.

Booster configuration included in Tab 47 applies to Booster 372, also.

Countdown tasks will be assigned the same times as for the 1160/376 launch, Tab 47, with the exception that time of Task 3, Vehicle Erection and Preparation, will be lengthened to 90 minutes and overall count to 500 minutes.

Tables 8-1 and 8-2 of the basic LTD will be used for engineering sequential and documentary optics coverage, respectively, with the exception that any reference to solid motors will be disregarded. Also camera location for Item 11.7 has been changed from "M" to "E". Camera position diagram for each pad is included in revision to the basic LTD soon to be issued.

The following LMSC documents are applicable to S-01A vehicle 1411:

Vehicle Test Plan - 1357403
Telemetry Instrumentation Schedule - 1357200

FLIGHT TEST INFORMATION

Booster	SLV-2 serial 372
Satellite Vehicle	S-01A serial 1411
Launch Pad	75-1, Pad 1
Pad Azimuth	259.5 deg
Launch Azimuth	172 deg
Primary Flight Mission (1):	
Perigee	165 nm
Orbit inclination angle	81.8 deg
Period	90.6 min
Gross lift-off weight	123,448 lbs
Alternate flight mission (2):	
Perigee	113 nm
Orbit inclination angle	81.8 deg
Period	90.9 min
Gross lift-off weight	123,762 lbs
Scheduled Launch Date	22 April 1963
Launch Window	To be announced

(1) Reference LMSC A094529-5.

This mission will be used unless further notice is given.

(2) Reference LMSC A094529-7.

(3) Weight based on information available at time of preparation. May vary slightly at launch.

[redacted]

LMSC 445925-D
TAB 48
1411/372

FLIGHT PLAN BOOSTER 372

Two seconds after liftoff, the booster will begin a 6.731 deg/sec roll program. At T+15 seconds, the booster will have completed the initial roll program. The roll program is about a vertical axis from the indicated pad azimuth to the pitch phase azimuth of 172 degrees true. Positive roll is clockwise rotation as viewed from the rear of the booster.

T+17 to burnout - The booster will execute the following pitch program:

Time (sec)	Pitch Rate (deg/sec)
0 to 17	0
17 to 35	-0.80121
35 to 70	-0.60206
70 to 90	-0.50868
90 to 130	-0.25028
130 to burnout	0

No yaw rate will be programmed for the primary mission. The flight controller will execute the following timed events:

Time (sec)	Event
T+90	BTL guidance system enable
T+110	Gain change
T+138	MECO enable

MECO will be executed at T+147 (+5) seconds as the result of propellant depletion, or guidance command.

VECO will be executed 9.0 (± 0.9) seconds after MECO.

[redacted]

R. F. MONITOR LIST

SATELLITE VEHICLE

EQUIPMENT	CODE
Vehicle Link I	T-60
Vehicle Link II	T-59
Acquisition Beacon	T-25
Capsule Beacon and Drop Marker	T-65
VERLORT Receiver	S-30 D
VERLORT Transmitter	S-68 P
Auxiliary Command System	V-89

[redacted]

SATELLITE VEHICLE LANDLINE INSTRUMENTATION

SCHEDULE - S-01A VEHICLE 1411

RECORDER 1

Channel	Function
1	Gas Valve 1
2	Gas Valve 2
3	Gas Valve 3
4	Gas Valve 4
5	Gas Valve 5
6	Gas Valve 6
7	Roll Gyro Temp
8	Yaw Gyro Temp

RECORDER 3

Channel	Function
1	Helium Line Press
2	Guidance Gas Line Press
3	Spare
4	UDMH Sniffer
5	IRFNA Sniffer
6	Spare
7	Accelerometer Temp
8	Oven Temp

RECORDER D-1

Channel	Function
1	Pitch Servo
2	Yaw Servo
3	Pitch Actuator
4	Yaw Actuator
5	H/S Pitch
6	H/S Roll

RECORDER 13

Channel *	Event
25	Helium Valve Closed
26	Fuel Vent
27	Ox Vent Umbilical Conn.
28	Umbilical Drop
29	DACO Lift Off
30	Time Pulse

* 1 to 24 Spares

RECORDER 2

Channel	Function
1	AP 10
2	Spare
3	AP 9
4	Spare
5	AP 12
6	AP 18
7	Spare
8	P/L Skin Temp

RECORDER 4

Channel	Function
1	Spare
2	Spare
3	N_2 Sphere Temp High Scale
4	N_2 Sphere Temp Low Scale
5	He Sphere Temp Low Scale
6	He Sphere Temp High Scale
7	Ox Vent Press
8	Fuel Vent Press

D-2 RECORDER

Channel	Function
1	Pitch Gyro
2	Yaw Gyro
3	Roll Gyro
4	GV 1-6
5	Counter Warning
6	Velocity Number Readout

LOB CEC RECORDER

Channel	Function
7	Battery Current
8	Single Phase Power Supply
11	Time Pulse
12*	115 V, 400 cps, ØAB
16*	-28 VDC Reg
20	+28 VDC Reg
[redacted]	115 V, 400 cps, ØBC
[redacted]	+28 VDC, Ext Pwr Supply
26	115 V, 400 cps, ØAC

All other channels are spares

[redacted]

* 14

Batt Voltage 28v

BOOSTER LANDLINE INSTRUMENTATION SCHEDULE

Function	Range	Nominal Values
Main liquid oxygen tank pressure	0-50 psig	33 psig
Main fuel tank pressure	0-50 psig	28 psig
Nitrogen storage tank bottle pressure	0-8,000 psig	6,000 psig
High-pressure missile bottle pressure	0-5,000 psig	3,000 psig
Vernier fuel start tank pressure	0-1,000 psig	646 psig
Vernier liquid oxygen start tank pressure	0-1,000 psig	646 psig
Engine regulator discharge pressure	0-800 psig	646 psig
Liquid oxygen storage tank pressure	0-150 psig	71 psig
Fuel storage tank pressure	0-150 psig	53 psig
Control manifold pressure	0-200 psig	135 psig
Transducer 5-volt supply	0-10 volts	5 volts
Hydraulic return pressure	0-200 psig	80 psig

BOOSTER TELEMETRY INSTRUMENTATION SCHEDULE

FM/FM Channel	Center Frequency	Function	Range
8	3.0	Vernier engine No. 2 chamber pressure	0 to 500 psia
9	3.9	Combined BTL commands	0 to 5 volts
10	5.4	Main engine chamber pressure	0 to 800 psia
11	7.35	Sequence No. 1: fuel & lox float switches, MECO, VECO	0 to 5 volts
12	10.5	Magnetron current (BTL)	0 to 100%
E	70.0	PDM/FM/FM	See below

PDM/FM Channel	Function	Range
1	5-volt absolute	0 to 5 volts
2	Instrumentation ground	0 to 5 volts
3	Main engine pitch position	± 2 degrees
4	Main engine yaw position	± 2 degrees
5	Vernier engine No. 1 pitch position	± 20 degrees
6	Vernier engine No. 1 yaw position	0 to -20 deg
7	Vernier engine No. 2 pitch position	± 20 degrees
8	Vernier engine No. 2 yaw position	0 to +20 deg
9 & 31	Pitch attitude error	± 4 degrees
10 & 32	Yaw attitude error	± 4 degrees
11 & 33	Roll attitude error	± 4 degrees
12 & 34	Pitch rate	± 2 deg/sec
13 & 35	Yaw rate	± 2 deg/sec
14 & 36	Roll rate	± 8 deg/sec
15 & 37	Pitch command	± 3.5 deg/sec
16 & 38	Yaw command	± 3.5 deg/sec
17	Actuator potentiometer positive	0 to 30 volts
18	Actuator potentiometer negative	-13 to -30 volts
19	400-cps voltage, phase A (control inverter)	110 to 120 volts
20	5-volt potentiometer excitation	0 to 5 volts
21	Automatic gain control (BTL)	0 to -90 dbm
22	Input supply voltage (BTL)	20 to 36 volts
23	Missile battery voltage	0 to 32 volts
24	Telemetry battery voltage	0 to 32 volts
25	Hydraulic supply pressure	0 to 4,000 psia
26	Hydraulic return pressure	0 to 200 psia
27	Turbopump speed	0 to 8,000 rpm
28	Turbine inlet temperature	0 to 1,500 deg F
29	Fuel pump inlet pressure	0 to 200 psia
30	Spare	--
39	Lox pump inlet pressure	0 to 100 psia
40	Main fuel tank top pressure	0 to 100 psia
41	Gas generator lox injection pressure	0 to 800 psia
42	Main lox tank top pressure	0 to 100 psia
43	Lox pump inlet temperature	-275 to -300 deg F
44	Framing signal	0 to 5 volts
45	Framing signal [redacted]	0 to 5 volts

MAGNETIC TAPE TRACK ASSIGNMENTS (PDM)

Track	Assignment	Type
1	Pulse-duration modulation (70 KC)	Pulse Record
2	Agena telemetry receiver No. 1; 100-KC wow & flutter	Direct
3	Thor telemetry receiver No. 2; 100-KC wow & flutter	Direct
4	60 CPS, 17-KC speedlock AGC No. 1 (5.4 KC) AGC No. 2 (7.35 KC) AGC No. 3 (10.5 KC) Liftoff signal (22 KC) Voice (30 KC)	Direct
5	Thor telemetry receiver No. 3; 100-KC wow & flutter	Direct
6	100-PPS, 17-bit binary-coded timing, modulated on 1 KC	Direct
7	1-PPS, 17-bit binary-coded timing, modulated on 1 KC	Direct

Recording Speed (All Tracks): 60 IPS

WEATHER CONDITIONS

General Information

Since there are no solid motors attached to Booster 372, the weather restrictions for launch will be similar to those established for previous program 162 launches in lieu of those set forth in 7.8 of the basic LTD. The latter applies specifically to SLV-2A launches.

Visibility

Visibility requirements set forth in paragraph 7.8.1 of the basic LTD, which provides for optical coverage of booster in flight, should be disregarded. There are no visibility restrictions for this launch.

Wind Restrictions

Upper wind conditions derived from PMR soundings are reviewed at LMSC, Sunnyvale for wind shear conditions as set forth in the basic LTD. Other elements of upper weather will not normally affect a launch schedule.

Surface weather conditions, except for wind velocity, will not normally affect a launch schedule. The space systems's maximum wind tolerance, 50 knots, is limited by the characteristics of the umbilical mast.

Before fueling and pressurization have been completed, the following surface wind restrictions (in knots) are applicable:

Fuel Load	Toppling Condition	Launcher Pins In	Pins In and Clamshells Closed
Vehicle empty	17	50	50
S-01A only loaded	27	50	50
Vehicle loaded	45	45	50

[redacted]

TAB 49

PROGRAM 162 LAUNCH TEST DIRECTIVE (U) for PROGRAM 162 VEHICLE 1161/362 (U)

Contract AF 04(695)-233

APPROVED:

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Launch Test Working Group

APPROVED:

S. M. Abeles
Douglas Project Engineer, VAFB
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APPROVED:

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Vandenberg Field Station
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APPROVED:

for L. A. Perry, Jr., Colonel, USAF
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6595th Aerospace Test Wing (AFSC)

LOCKHEED AIRCRAFT CORPORATION
Missiles and Space Company
Vandenberg Air Force Base, California

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63-1821

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OF CYS

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CONTENTS - TAB 49

		Page
1.	Introduction	49-1
2.	Flight Test Information	49-3
3.	Flight Plan and Timed Events	49-4
4.	S-01A Landline Instrumentation Schedule	49-5
5.	Booster Landline Instrumentation Schedule	49-7
6.	Booster Telemetry Instrumentation Schedule	49-9
7.	PMR Magnetic Tape Track Assignments	49-13
8.	VTS Magnetic Tape Track Assignments	49-14
9.	RF Monitor List	49-15

63-1821
6595TH TW ____ CY ____ OF ____ CYS

[redacted]

[redacted]

INTRODUCTION

This Tab applies to Program 162 Launch Test Directive, LMSC 445925-D, and should be inserted in the back of that publication. It covers launch preparation and launch of S-01A satellite vehicle 1161 mated to SLV-2A booster 362. The vehicle is scheduled to launch from VAFB Complex 75-3, Pad 4.

The BTL missile-borne guidance system will be installed in the S-01A satellite vehicle. Commands to the booster will be routed through the SLV-2A/S-01A BTL interface plug. The guidance phase will continue after separation and will terminate at about T + 450 seconds.

Recovery of one of the three solid booster motors is desired, if it is floating.

The Pad 4 camera location diagram, page 46-14 of TAB 46, should be used with optical data requirements in lieu of the figure contained in the basic LTD. Also, Documentary Photographic Requirements, page 46-13 of TAB 46, should be used.

Surface Wind Limitations, SLV-2A/S-01A Vehicles

The following surface wind restrictions supersede those set forth in paragraph 7.8.3 of the basic LTD: A launch will not be attempted when the wind velocity at the launch site exceeds 40 knots from any direction, or when the wind velocity exceeds 30 knots from the critical sector. The critical wind sector for Pad 4 is 000 to 135 degrees.

Surface wind will restrict all activity at the launch pad requiring the vehicle to be erected. The standard SLV-2A/S-01A may not be erected when surface winds, including gusts, exceed the following limits (in knots):

Configuration	Toppling Condition	Launcher Pins In
Vehicle empty without solid motors	16	46
Vehicle empty with solid motors attached	32	46
S-01A only loaded with solid motors attached	37	41
Vehicle loaded with solid motors attached	37	37
Vehicle loaded and pressurized with solid motors attached	63	64

Visibility Requirements

In order to track the booster and solid motors as set forth under Booster Photographic Data, sufficient visibility to enable tracking cameras to follow the flight of the vehicle until solid motor jettisons and descent is required.

[redacted]

Booster Photographic Data

Engineering Sequential

Two prints of all engineering photography are required for this launch and for specific subsequent launches. The two sets of prints are due for delivery to DAC/VAFB by T + 25 hours. One set of prints will be forwarded immediately to DAC, Santa Monica.

Special Photography

Special tracking film will be required for this launch and for specified subsequent launches. DAC has ordered this film through the LTWG. The photography should include 6 inch resolution in tracking the solid motors through their ejection, ballistic trajectory, and impact.

[redacted]

[redacted]

FLIGHT TEST INFORMATION

Booster	SLV-2A 362
Satellite Vehicle	S-01A 1161
Launch Pad	Complex 75-3 Pad 4
Pad Azimuth	181.5 deg
Launch Azimuth	175 deg
Perigee Altitude	110 nm
Perigee Latitude	30 deg N
Orbit Inclination Angle	81.8 deg
Period	90.9 min
Gross Liftoff Weight (1)	152,986 lbs

(1) Best information available as of 4/22/63. Payload changes under consideration may vary this weight.

[redacted]

FLIGHT PLAN - BOOSTER 362

The flight control program for the primary trajectory is:

Time (sec)	Roll	Pitch	Yaw
0 to 2	0	0	0
2 to 3.667	+4.173	0	0
3.667 to 4	0	0	0
4 to 9.667	0	-2.681	0
9.667 to 10	0	0	0
10 to 54.667	0	-0.689	0
54.667 to 55	0	0	0
55 to 79.667	0	-0.511	0
79.667 to 80	0	0	0
80 to 82.760	0	-0.212	-0.833
82.760 to 83.093	0	0	0
83.093 to 170	0	-0.212	0

The flight control system will be arranged for the following plan of events:

Time	Timed Event
T + 55 sec	Enable separation circuitry (solid motor)
T + 70 sec	Solid motor separation; roll gain change
T + 80 sec	Solid motor separation backup signal; Guidance enable
T + 102 sec	Enable vernier engine yaw movement; Main engine gain change
T + 138 sec	MECO enable

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[redacted]

LANDLINE INSTRUMENTATION SCHEDULE

S-01A VEHICLE 1161

RECORDER NO. 1

Channel	Function
1	Guidance Gas Fill Line Drop
2	He High Press. Fill Line Drop
3	Fuel Fill Line Drop
4	Acid Fill Line Drop
5	Air Cond. Line Drop
6	P/L Blanket Drop
7	
8	Lift-Off

RECORDER NO. 2

1	AP18
2	AP12
3	AP 8
4	AP10
5	AP 2
6	AP 9
7	AP 3
8	Lift-Off

RECORDER NO. 3

1	He Sphere Temp.
2	He Sphere Temp.
3	N_2 Sphere Temp.
4	N_2 Sphere Temp.
5	L/B Mode and Event
6	He Line Press.
7	Guidance Gas Line Press.
8	Lift-Off

RECORDER NO. 4

1	Oxid Vent Line Press.
2	Fuel Vent Line Press.
3	Oxid Vent Umbilical Connect
4	Fuel Vent Umbilical Connect
5	P/L Skin Te[redacted]
6	Oxid Sniffe[redacted]
7	Fuel Sniffe[redacted]
8	Lift-Off

LANDLINE INSTRUMENTATION SCHEDULE (Cont'd)

S-01A VEHICLE 1161

RECORDER NO. 5

Channel	Function
1	+28VDC Reg.
2	-28 VDC Reg.
3	Batt. Curr.
4	+28VDC Type X
5	-28 VDC Unreg bus
6	+28 VDC Unreg bus
7	+28 VDC Pyro bus
8	Lift-Off

RECORDER NO. 6

Channel	Function
1	Gas Valve 1
2	Gas Valve 2
3	Gas Valve 3
4	Gas Valve 4
5	Gas Valve 5
6	Gas Valve 6
7	Yaw Gyro Temp.
8	Roll Gyro Temp.

RECORDER NO. D1

Channel	Function
1	Pitch Servo Cmmd.
2	Yaw Servo Cmmd.
3	Pitch Hyd. Input
4	Yaw Hyd. Input
5	Pitch Actuator
6	Yaw Actuator
7	V/M Acc. Temp.
8	F/M Oven Temp.

RECORDER NO. D2

Channel	Function
1	Pitch Gyro Out
2	Yaw Gyro Out
3	Roll Gyro Out
4	Gas Valves 1-6
5	H/S Pitch
6	H/S Roll
7	Counter Warning
8	V/M Readout

[redacted]

BOOSTER LANDLINE INSTRUMENTATION

GROUND MONITOR SYSTEM

FUNCTION	RANGE	NOMINAL VALUES
Main liquid oxygen tank pressure	0-50 psig	33 psig
Main fuel tank pressure	0-50 psig	28 psig
Nitrogen storage tank bottle pressure	0-8,000 psig	6,000 psig
High-pressure missile bottle pressure	0-5,000 psig	3,000 psig
Vernier fuel start tank pressure	0-1,000 psig	646 psig
Vernier liquid oxygen start tank pressure	0-1,000 psig	646 psig
Engine regulator discharge pressure	0-800 psig	646 psig
Liquid oxygen storage tank pressure	0-150 psig	71 psig
Fuel storage tank pressure	0-150 psig	53 psig
Control manifold pressure	0-200 psig	135 psig
Transducer 5-volt supply	0-10 volts	5 volts
Hydraulic return pressure	0-200 psig	80 psig

[redacted]

[redacted]

BOOSTER LANDLINE INSTRUMENTATION

EVENTS RECORDER CHANNEL ASSIGNMENTS

CHANNEL	EVENT
1	Base timing
2	Power on (sequence initiation)
3	Phase completion (resets automatically)
4	Flight controller on
5	Fuel storage tank vent valve closed
6	Control manifold pressurizing valve open
7	Missile bottles pressurizing valve open
8	Lox storage tank vent valve closed
9	Lox storage tank pressurizing valve open
10	Hydraulics normal
11	Engine centered
12	Engine off center
13	Engine recentered
14	Launcher hydraulics normal
15	Missile bottles pressurized
16	Engine purge on
17	Main fuel tank vent valve open
18	Fuel storage tank pressurizing valve open
19	Fuel fine load valve open
20	Lox fine load valve open
21	Lox rapid load valve open
22	Fuel rapid load valve open
23	Main lox tank vent valve open
24	97% fuel
25	100% fuel
26	Main fuel tank pre-pressurizing valve open
27	BTL guidance on internal power
28	95% lox
29	Inverter on
30	Inverter on internal
31	Flight controller on internal
32	Booster on internal power
33	Launcher clear to fire
34	Lox transfer resume
35	Main lox tank vent valve boost close
36	Main lox tank pre-pressurizing valve open
37	99% lox
38	100% lox
39	Main propellant tanks pressurized
40	Propellant transfer complete
41	Engine start
42	Liftoff
43	Technical hold imposed
44	Malfunction
45	Propellant hold over-ride
46	Flight controller and hydraulics over-ride
47	Phase V hol [redacted]
48	"Proceeding [redacted]
49	Liftoff sig [redacted]
50	Internal ti [redacted]

BOOSTER 362
CHANNEL ASSIGNMENTS, IN-FLIGHT TELEMETRY

FM/FM Channels, Kit No. 1

FM/FM Channel	Center Frequency	Function	Range
7	2.3	Main engine chamber pressure, close-coupled transducer	0 to 800 psia
8	3.0	Solid motor chamber pressure, high range, solid motor No. 3	0 to 100 psia
9	3.9	Sequence No. 1 fuel and lox float switches, MECO, VECO	0 to 5 volts
10	5.4	Solid motor chamber pressure, high range, solid motor No. 3	0 to 800 psia
11	7.35	Vibration, yaw axis, solid motor attach	± 3 g
12	10.5	Vibration, yaw axis, transition section (fuel tank dome)	± 3 g
13	14.5	Vibration, pitch axis, transition section (fuel tank dome)	± 3 g
A	22.0	Vibration, yaw axis, transition section, flight controller	± 30 g
C	40.0	Vibration, transition section, longitudinal axis, flight controller	± 30 g
E	70.0	Subcommutated to 45 PDM channels	See page 49

FM/FM Channels, Kit No. 2

FM/FM Channel	Center Frequency	Function	Range
7	2.3	Sequence No. 3: solid motor removals, No. 1, No. 2, No. 3	0 to 5 volts
8	3.0	Sequence No. 2: ignition switches 1 & 2 pickup, separation signals (primary & backup)	0 to 5 volts
9	3.9	Vehicle axial acceleration	0 to 8 g
10	5.4	Solid motor chamber pressure, low range, solid motor No. 2	0 to 100 psia
11	7.35	Solid motor chamber pressure, high range, solid motor No. 1	0 to 800 psia
12	10.5	Vibration, yaw axis, center section (lox tank dome)	± 12 g
13	14.5	Vibration, pitch axis, center section (lox tank dome)	± 3 g
A	22.0	Solid motor chamber pressure, high range, solid motor No. 2	0 to 800 psia
C	40.0	Subcommutated [redacted]	See page 49
E	70.0	Vibration, en[redacted]nal axis	± 300 g

[redacted]

LMSC 445925-D
TAB 49
1161/362

BOOSTER 362
PDM Channel Assignments, Kit No. 1

Channel	Function	Range
1	5-volt absolute	0 to 5 volts
2	Instrumentation ground	0 to 5 volts
3	Main engine pitch position	± 2 degrees
4	Main engine yaw position	± 2 degrees
5	Vernier engine No. 1 pitch position	± 45 degrees
6	Vernier engine No. 1 yaw position	-8 to -28 deg
7	Vernier engine No. 2 pitch position	± 45 degrees
8 & 30	Vernier engine No. 2 yaw position	+8 to +28 deg
9 & 31	Pitch attitude error	± 4 degrees
10 & 32	Yaw attitude error	± 4 degrees
11 & 33	Roll attitude error	± 6 degrees
12 & 34	Pitch rate	± 4 deg/sec
13 & 35	Yaw rate	± 3.5 deg/sec
14 & 36	Roll rate	± 8 deg/sec
15 & 37	Pitch command	± 4 deg/sec
16 & 38	Yaw command	± 3.5 deg/sec
17	Actuator potentiometer positive voltage	0 to 30 volts
18	Actuator potentiometer negative voltage	-13 to -30 volts
19	400-cps voltage, phase A control inverter	110 to 120 v
20	5-volt potentiometer excitation	0 to 5 volts
21	Vernier engine No. 2 chamber pressure	0 to 500 psia
22	Main lox tank top pressure	0 to 100 psia
23	Missile battery voltage	0 to 32 volts
24	Telemetry battery voltage	0 to 32 volts
25	Hydraulic supply pressure	0 to 4,000 psia
26	Hydraulic return pressure	0 to 200 psia
27	Turbopump speed	0 to 8,000 rpm
28	Turbine inlet temperature	0 to 1,500 deg F
29	Not assigned	
8 & 30	Vernier engine No. 2 yaw position	+8 to +28 deg
9 & 31	Pitch attitude error	± 4 degrees
10 & 32	Roll attitude error	± 4 degrees
11 & 33	Yaw attitude error	± 6 degrees
12 & 34	Pitch rate	± 4 deg/sec
13 & 35	Yaw rate	± 3.5 deg/sec
14 & 36	Roll rate	± 8 deg/sec
15 & 37	Pitch command	± 4 deg/sec
16 & 38	Yaw command	± 3.5 deg/sec
39	Not assigned	
40	Main fuel tank top pressure	0 to 100 psia
41	Gas generator lox injector pressure	0 to 800 psia
42	Vernier engine No. 2 chamber pressure	0 to 500 psia
43	Lox pump inlet temperature	-275 to -300 deg F
44	Synchronization signal	0 to 5 volts
45	Synchronization signal	0 to 5 volts

[redacted]

* BTU per square foot per secon [redacted]

PDM Channel Assignments, Kit No. 2

Channel	Function	Range
1	5-volt absolute	0 to 5 volts
2	Instrumentation ground	0 to 5 volts
3	Solid motor chamber pressure, low range, solid motor No. 1	0 to 100 psia
4	Static pressure, PX-7	0 to 15 psia
5	Static pressure, PX-8	0 to 15 psia
6	Static pressure, PX-9	0 to 15 psia
7	Static pressure, PX-10	0 to 15 psia
8	Static pressure, PX-11	0 to 15 psia
9	Static pressure, PX-12	0 to 15 psia
10	Static pressure, PX-13	0 to 15 psia
11	Static pressure, PX-14	0 to 15 psia
12	Static pressure, PX-15	0 to 15 psia
13	Static pressure, PX-16	0 to 15 psia
14	Static pressure, PX-17	0 to 15 psia
15	Static pressure, PX-18	0 to 15 psia
16	Static pressure, PX-19	0 to 15 psia
17	Static pressure, PX-20	0 to 15 psia
18	Solid motor chamber pressure, low range, solid motor No. 1	0 to 100 psia
19	Static pressure, PX-1	0 to 15 psia
20	Static pressure, PX-2	0 to 15 psia
21	Static pressure, PX-3	0 to 15 psia
22	Static pressure, PX-4	0 to 15 psia
23	Static pressure, PX-5	0 to 15 psia
24	Static pressure, PX-6	0 to 15 psia
25	Not assigned	---
26	Solid Motor No. 1 separation	0 to 5 volts
27	Solid Motor No. 2 separation	0 to 5 volts
28	Solid Motor No. 3 separation	0 to 5 volts
29	Not assigned	---
30	Not assigned	---
31	Not assigned	---
32	Not assigned	---
33	Solid motor chamber pressure, low range, solid motor No. 1	0 to 100 psia
34	Not assigned	---
35	Not assigned	---
36	Not assigned	---
37	5-volt potentiometer excitation	0 to 5 volts
38	Not assigned	---
39	Not assigned	---
40	Not assigned	---
41	Heating rate sensor $\dot{q}$ T-1 outboard	0 to 30 BTU *
42	Heating rate sensor $\dot{q}$ T-2 inboard	0 to 30 BTU *
43	Not assigned	---
44	Synchronization signal	0 to 5 volts
45	Synchronization sig[redacted]	0 to 5 volts

* BTU per square foot per second [redacted]

Channel Assignments, Kit No. 3

FM/FM Channel	Center Frequency	Function	Range
9	3.9	Lox pump putlet pressure	0 to 1,000 psia
10	5.4	Fuel duct outlet pressure	0 to 1,000 psia
11	7.35	Lox pump inlet pressure	0 to 100 psia
12	10.5	Fuel pump inlet pressure	0 to 200 psia
13	14.5	Yaw acceleration, engine relay box	± 10 g
A	22.0	Pitch acceleration, engine relay box	± 10 g
C	40.0	Longitudinal acceleration, engine relay box	-5 to +20 g
E	70.0	Axial acceleration, lox dome	± 25 g

[redacted]

LMSC 445925-D
TAB 49
1161/362

PMR MAGNETIC TAPE TRACK ASSIGNMENTS

RECORDER	TRACK	DIRECT RECORDING ASSIGNMENT (60 IPS)
1	1	100-pps timing, AMR format D-5, modulated on 1 kc
1	2	SLV-2A telemetry link No. 1 primary, 100-kc wow and flutter (Tango 48)
1	3	SLV-2A telemetry link No. 2 primary, 100-kc wow and flutter (Tango 61)
1	4	60-cps, 17-kc speedlock; AGC No. 1 (5.4 kc); AGC No. 2 (7.35 kc); AGC No. 3 (10.5 kc); AGC No. 4 (14.5 kc); liftoff signal (22 kc); voice (30 kc)
1	5	SLV-2A telemetry link No. 3 primary, 100-kc wow and flutter (Tango 90)
1	6	SO-1 telemetry link No. 2 primary, 100-kc wow and flutter
1	7	1-pps timing, AMR format B-1, modulated on 1 kc
2	1	100-pps timing, AMR format D-5, modulated on 1 kc
2	2	SLV-2A telemetry link No. 1 secondary, 100-kc wow and flutter
2	3	SLV-2A telemetry link No. 2 secondary, 100-kc wow and flutter
2	4	60-cps, 17-kc speedlock; AGC No. 1 (5.4 kc); AGC No. 2 (7.35 kc); AGC No. 3 (10.5 kc); AGC No. 4 (14.5 kc); liftoff signal (22 kc); voice (30 kc)
2	5	SLV-2A telemetry link No. 3 secondary, 100-kc wow and flutter
2	6	SO-1 telemetry link No. 2 secondary, 100-kc wow and flutter
2	7	1-pps timing, AMR format B-1, modulated on 1 kc

[redacted]

[redacted]

LMSC 445925-D
TAB 49
1161/362

VTS MAGNETIC TAPE TRACK ASSIGNMENT FOR LAUNCH

TRACK NUMBER	FUNCTION
1	S-01A TLM Link 1 Primary Antenna
2	S-01A TLM Link 2 Primary Antenna
3	SLV-2A TLM Link 2 Secondary Antenna
4	SLV-2A TLM Link 1 Secondary Antenna
5	Voice
6	Speed Lock 10 and 50 KC Reference Signals
7	Systems Time Signal Strength a. S-01A TLM Link 1 b. S-01A TLM Link 2 c. SLV-2A TLM

[redacted]

[redacted]

R. F. MONITOR LIST

SATELLITE VEHICLE 1164

EQUIPMENT	CODE
Mud Flap	T-47
Vehicle TLM	T-60
Special Projects TLM	T-28
Acquisition Beacon	T-25
Capsule TLM	T-59
Capsule Beacon and Drop Marker	T-65
VERLORT Receiver	S-30D
VERLORT Transmitter	S-68P
Auxiliary Command System	V-89
Special Projects Command	V-95